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ABSTRACT

This paper discusses a program developed and implemented to improve the skills and attitudes of junior high school students in the area of measurement. The program tested three educational groups: regular education students, special education students, and academically gifted students. Results from this program indicated improvement in measuring skills at all levels tested. Included in this report are: (1) the purpose of the program; (2) background; (3) a description of the program methods; (4) a summary of results; and (5) recommendations. A list of 29 references, an annotated bibliography of 15 references, graphs of results, programs forms (pre-test forms, worksheets, and post-test forms), and a table of results are provided. (CW)

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IMPLEMENTATION OF A PROGRAM TO IMPROVE ENGLISH MEASUREMENT SKILLS IN THE JUNIOR HIGH SCHOOL INDUSTRIAL ARTS PROGRAM

JEFFERY P. SMITH

Practicum Report

Submitted to the Center for the Advancement of Education of Nova University in Partial Fulfillment of the Requirements for the Degree of Educational Specialist

Running Head: ENGLISH MEASUREMENT SYSTEM

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Abstract

Implementation of a program to improve English Measurement skills in the Junior High Industrial Arts Program. Smith, Jeffery P., 1986 Practicum Report, Nova University, Center for the Advancement of Education Descriptors: Classroom techniques, Curriculum Development, Industrial Arts, Measurement Techniques, Teaching Methods, Industrial Education, Trade and Industrial Education.

The author developed and implemented a program to improve English Measurement skills of Junior High Industrial Art students. The program's main aim was to improve skills and attitudes of Junior High students in the area of measurement. The program tested three educational groups: Regular education, Special Education and Gifted students.

The program shows improvement in measuring skills at all levels tested. This program is being considered for adoption in the targeted district.

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Chapter I Purpose

Phoenix, Arizona is in the southwest sunbelt of the United States. This area of the country has experienced sudden growth in population during the last two decades. Because of this situation, a highly diverse population has been growing in this area. Construction is at an all time high and jobs in the industry are plentiful.

The purpose of this practicum proposal is to ascertain the skills involved in linear measurement that are used by the construction industry. The standard measurement system used in the construction industry is the English measurement system.

It is this writer's intent to determine what measurement skills are currently being taught and hopefully improve upon those skills necessary for success in the future job market of the construction industry.

The target school is located in the northwest section of the greater Phoenix area. The school is a junior high school and is one of 17 schools in the local school district.

School records show that the population of the target school fluctuates between 850 and 925 students throughout the school year. The ethnic make-up of the school is 30% minorities and 70% Anglo-Americans.

The school consists of students on the seventh and eighth grade levels. Retention history of the school is at approximately 8% according to the assistant principal. School records show that attendance is a problem at the target school, however, several programs have been implemented by the administration in order to improve this situation.

The community of the target school has a lower middle class income status. The average income of a household in the area is less than $20,000. District records show that approximately 40% of the student population in the school district are on free and reduced lunch programs.

Parental interest at the target school is low. Parent support groups and community involvement of the school are almost nonexistent. During Parent-Teacher Conferences, less than 10% of the parents of the writer's students attend the conferences.

The writer has been teaching Industrial Arts at the target school for 13 years. During this time class size has varied greatly from 55 students per period to less than 10 per period. As a result of the recent change in administrators, class size has been altered. Presently the average class has a 1 to 20 teacher-pupil ratio.

The setting for this practicum is the Industrial Arts

classes at the target school. There are six classes daily, with each class being 50 minutes in length. The make-up of each class varies according to ability groupings.

The target school is located near a U.S. Air Force base, and a large number of students transfer into the school regularly. The area is mainly composed of rental homes and therefore students move in and out of the school frequently.

Under the present situation, the Industrial Arts program is an elective class. Electives allow the counselor and the administrator to alter the schedule of the students where necessary. Statistics illustrate a 75% turnover rate within the elective courses, while the target school records verify a 17% turnover rate within the past two years. The degree of control over students in the classes will vary because of outside factors, such as turnover rate, that influence the make-up of the classes.

Linear measurement in the English system is not part of the curriculum that is being taught in the target school. The problem that exists is that students, who graduate and obtain jobs in the construction industry, lack the skill of linear measurement.

The researcher has provided charts in Appendix A that illustrate a problem exists in the target school. The bar graphs indicate the percentage of correct responses and compares them to the national average of the United States. In 1985 the target school used the Iowa Test of Basic Skills and once again the target school fell below the national average.

The writer and other staff members have documented that the performance of students in the target school on linear measurement skills are less than 25% correct. Measurement skills are essential to being successful in the Industrial Arts curriculum. The curriculum is the World of Construction by McKnight and McKnight (1970).

This program is exploratory in nature. It is designed to encourage students to choose a career in the construction field. However, most students become frustrated when required to do accurate measurement tasks. Because of this factor, many lose interest and pursue other career choices.

The writer has owned a construction company which hired students for summer work. The main factor in obtaining a job as determined by standards of the Associated General Contractors in the Phoenix area is measurement skills. Without acceptable measurement skills, applicants for jobs are usually not hired.

The general contractors in the Phoenix area give pre-employment tests to determine knowledge of the construction trade. Measurement is a vital part of those tests.

During the 1970's in the United States the National Bureau of Standards Metric Information Office began to convert this country to the metric system. The federal government enacted Public Law 90-472 on August 9, 1968 to convert the country to the metric system over a 10 year period of time. In 1974, President Ford signed the Education Amendments of 1974 which contained a special provision to prepare students to utilize the metric system as part of the regular education curriculum.

In 1976 Arizona State Board of Education issued a directive to all school districts. In that directive was a statement concerning the metric conversion. It suggested that all schools teach metric measurement as the primary measurement system and this should be implemented prior to 1980. However, before 1980, the directive was revoked and no further action was taken by the state of Arizona concerning metric measurement. Therefore when textbooks were adopted in 1976, the books which favored the metric system were selected for use in the school. The policy of the target district is to adopt textbooks once every five years. The current texts in math

and science therefore avoid the use of the English measurement system. These texts only refer to the English system for the purpose of conversion.

During the past nine years English measurement skills have not been taught in the target school. However, implementation of the metric system did not occur during this period, and the trend to convert to the metric system has lost its enthusiasm.

The construction industry avoided the metric challenge and continues to use the English system. The tools and materials used by the construction trade are in the English system, therefore, it would have been a great expense for tradesmen to convert to the metric system.

Since all of the tools and materials used by the Industrial Arts classes of the target school were in the English system, the problem of students entering the classes without basic measurement skills grew. More time was spent on measuring skills than ever before. Curriculum time on measurement had to be increased and time spent on building tasks decreased.

In research Steffe (1976) notes one of the goals in the instruction of measurement is to instill the practice of tasks involving measurements. Measurement tasks used were measuring actual objects and recording their sizes on a drawing of the

object. This task helps students see the value of accurate measurements.

Therefore, this writer designed and implemented a program to improve measuring skills using the English system of measurement. This writer created a pre-test and improved the skills during a six-week implementation period. The results showed that students successfully utilized measurement skills to construct a meaningful product.

The main objective of this practicum is to instill a positive attitude into Industrial Art students in the area of measurement skills. The goal was to have 75% of the students demonstrate correct measurement skills with a 75% accuracy rate.

The program was implemented over a six-week period of time. The students in the target group improved their measurement skills by demonstrating competency to the researcher. Competency means the student achieves at least a 75% score on the measurement post-test. Students took a pre-test prior to the implementation of the program and took a post-test after the completion of the program. The measurement skills course was integrated with the current curriculum and was a daily activity not to exceed ten minutes in duration.

Chapter II Research

The researcher has spent many hours on the collection of information pertaining to the subject of linear measurement. The results of this effort show that there is little information available on the topic of linear measurement in the English system.

The history of the United States measurement system dates back to the colonial era. The English measurement system was taken from the British during the settlement of the new world. The metric challenge began in the United States during George Washington's term as president.

DeSimone (1975) notes several nations began to convert to the metric system after 1840 when the French people were first required to use it. By 1850 Greece, the Netherlands, Spain and parts of Italy had adapted to the new units of measurement.

An international metric convention, held from 1870 to 1875, created measurement standards of greater accuracy for length and mass. Seventeen nations, including the United States, participated in this convention. According to DeSimone (1975) in 1875, they signed the Treaty of the Meter, which established a permanent organization to change the metric system as

necessary. This organization, called the International Bureau of Weights and Measures, has headquarters in Paris.

According to Bame (1979) in 1790, Secretary of State Thomas Jefferson recommended that the United States use a decimal measurement system. Congress rejected Jefferson's recommendations. Asimoc (1977) mentioned that in 1821 Secretary of State John Quincy Adams also proposed conversion to the metric system. But once again Congress turned down such actions. At that time the United States traded mostly with England and Canada, neither of which was considering any change in its measurement system. A conversion of U.S. measurements would have interfered with this trade.

The United States showed little interest in the metric system for more than 40 years following the Adams' proposal. Meanwhile, the nation's industries developed machines and products based on the English measurement system. Until the mid-1900's, many industries opposed conversion to the metric measurements. They believed such a step would require costly changes in their machines and manufactured products. In 1866, Congress made the metric system legal in the United States. But it took no action toward requiring the use of the metric measurement. During the next 70 years only a few metric

measurements began to come into daily use.

In 1965, Great Britain began a 10-year changeover to the metric system. Other members of the Commonwealth of Nations later decided to convert. The actions of the Commonwealth governments created new interest in the United States toward the metric system.

In 1968, Congress authorized a three-year study of the metric conversion. This study was directed by Daniel V. DeSimone in a report entitled A Metric America. DeSimone (1975 p. 363) states, "This committee recommends a step-by-step conversion to the metric system during a period of ten years."

Such a planned conversion would help to reduce the cost and problems of changing the nation's measurement system. However, in 1974, the House of Representatives defeated the metric conversion suggested by DeSimone (1975) in his report A Metric America.

Bame (1976 p. 26) states, "The change to the metric system of weights and measures is less urgent in the construction and related fields than manufacturing since international trade is less involved. Before a metric conversion can take place all basic materials and components including lumber, panel stock, brick, cement block, insulation, roofing materials,

windows, doors, shutters and all other materials must be available in metric standards."

In the building construction soft conversion from English to metric sizes is of no value in itself and could only be a waste of time. The nominal sizes of customary materials such as the familar 2"x4" framing material or the 4'x8' panels are good examples. If these were converted to metric units, complex and unnecessary size designations would result. While there might be some educational value in showing the metric equivalent, the practice could only complicate the building construction industry.

During the past 10 years the United States has refused to convert to the metric system. The Congress hasn't taken any action to force this country to the metric system. The attitude of the government has taken is one of necessity. The government feels each industry must meet their own needs, if they export goods and compete on the world market then they will change to the metric system to be competitive.

In the mid-1970's publishers of educational textbooks introduced the metric system into their curriculum. The teaching of linear measurement in either system involves the same techniques. Steffe (1976) notes that practice will instill

a higher level of accuracy. Inskeep (1976 p. 60) says "Activity gives meaning to the measuring skills."

In recent years the trend in the educational community is to teach metric measurement as the primary measuring system. However, education has experienced many phases such as the open concept and team teaching. Time can only tell if we need to convert to the metric system.

The author found the most valuable information on the English system in textbooks published prior to 1976. The best information came from textbooks and workbooks in drafting programs.

The researcher has noted that several textbooks by Brown (1985) have been updated with more emphasis being placed on the metric measurement system. The English system is used first by Brown (1961) when he refers to the task of dimensioning a drawing. Later in the chapter he suggests that all drawings be dual dimensional by using both systems at the same time.

Walker (1982) has avoided the use of dual dimensioning and doesn't use the system that Brown initiates in his book. Hinrichs (1975) has written a series of Industrial Art skills, one of which is measuring. He points out that the repetition of this task will ultimately improve the skills of measurement.

According to Hinrichs (1975 p. 6), "Learning to measure is a two-step procedure. First the student must be shown the "how to" of measuring. Then secondly the student must practice until he becomes skillful at measuring."

Performance is the best test to determine a student's measuring skills. Students can be grouped according to their ability levels. Working in small groups, students should do as many exercises as needed to become skillful within a certain measurement and no particular number should be required. Practice in measuring skills is essential for success, for without practice, students will soon forget the measuring techniques that they have acquired.

Textbooks in the area of mathematics need to be updated in the target district. Before a text is adopted, it should be reviewed and information on the English measurement system should be contained within the text. A program adoption that would teach measurement should start in the primary level and be continued until the student graduates from the secondary school system.

Visitations to other districts to ascertain if the problem of English measurement skills is present in other districts was done by the researcher. The problem of measurement skills is apparent in the neighboring school districts.

A computer search done by this writer to determine if the problem exists in other parts of the country show that the problem of measurement skills exists across the country. Many instructors seem to pass the buck and put the blame on other teachers in different areas. The trend in the target district seems to be, it isn't the job of the Industrial Arts instructors to teach measurement, rather it should be taught by the math department.

Students in the targeted district haven't been associated with the English measurement system since 1976, which was the last year the English measurement system was included in the the scope and sequence in the math curriculum. The researcher noted the problem of lack of skills in the English measurement system during the 1979-80 school year. Prior to this time, students showed little difficulty with measurement skills in the English system at the target school.

Research in the area of learning psychology shows that children learn new concepts when they perceive there is a need. The assimilation process involves a growing of new perceptual matter or stimulus into existing patterns of behavior.

According to Piaget (1966), there are four stages of development in children. Stage I, Sensori-motor, occurs at

age zero to two and is the process when learning takes place through the mouth or touching process. Stage II, Pre-operational level, occurs from ages two to seven. At this level, children are ego-centric and have a possessive viewpoint. They see only one way to solve a problem and their answer is the only one that they accept. Stage III, Concrete-operations, occurs at ages seven to eleven. At this age, children begin to reason and more learning can take place. Stage IV, Formal-operations, occurs at ages eleven to fifteen. At this stage, higher levels of thinking take place and children begin to realize that more than one conclusion can be drawn from a problem.

Students at the targeted school are in the Formal-operational years in the development stage. Combs (1978 p. 198) says, "Rate of learning may be accelerated by increasing the strength of the subject's needs." Therefore when students enter into the Industrial Arts program at the target school, the need for measurement skills increases. At this stage, the student's need has been strengthened for his need in measurement skills.

Combs (1978 p. 199) states, "It is only when events are perceived as having some important relationship to self that they are likely to produce change in a person's behavior and functioning." Students in the Industrial Arts program at the

target school begin to see a need for measurement skills when they begin the assembling process for building.

According to Piaget (1966), there are two types of measurements, visual and transfer. The first, visual, is a measurement of comparing two objects to each other. The second type of measurement is transfer. Piaget (1966 p. 28) states, "Transfer occurs when we measure one length and then place that length against another object." Visual measurement takes place from two until seven, while transfer measurement occurs from ages seven to fifteen.

Piaget (1966 p. 29) says, "We may reasonably suspect that perceptual tranfer can be regarded as a starting point for the operational movement of the foot rule when comparing distances, involving the real movement of a common measurement as against a virtual transfer."

On the subject of measurement Piaget (1966 p. 57) says, "Measurement is not generalized. It occurs only in the precise conditions in which it has been learned." Therefore had measurement been taught in the targeted school district, measuring skills would have scored higher on state tests. A program will be developed and implemented by the author to improve the attitude and skills of the students at the targeted school.

Chapter II Method

The problem of linear measurement skills in the English system is present at all ability levels at the target school. Three levels of students populate the Industrial Arts classes at the target school. The researcher implemented an improvement program at all levels to ascertain if students at different ability levels will improve their skills at the same rate.

The first group of students to be taught measurement skills was the advanced level student. This student was in eighth grade and was exposed to the Industrial Arts curriculum at the seventh grade level. This group of students was selected by the researcher and had succeeded in the Industrial Arts program at the seventh grade level. This group was small in size and had a student-teacher ratio of 1 to 13.

The second ability group was the regular education level. This type of student was new to the course and did not have any previous experiences in the Industrial Arts program at the target school. The teacher-pupil ratio was 1 to 24 or less.

The third group was made up of a combination of special education students. All types of special education were taught during the same period. Educable Mentally Handicapped

(EMH), Physically Handicapped (PH) and Learning Disabled (LD) made up this class. The teacher to pupil ratio was 1 to 20.

The researcher consulted with other professional Industrial Arts teachers at the building and district level. The purpose was to preview the proposed improvement plan and seek any helpful revisions or modifications that may enhance all students chances for success in the program.

The program implemented was selected as a supplementary program. The program is designed to enhance measurement skills by the use of practical application of measurement skills. It was decided by the researcher that when possible, this program can be used as a supplement to existing programs.

Measurement has not enjoyed a popular theme in the Industrial Arts program. Because many students were not familiar with English measurements, failure rates at this task were high in the researcher's existing program. Patterns were developed to minimize the necessity for measuring skills, however, this practice didn't improve the desired objectives of the curriculum.

The author's program was administered at three levels of ability. THose levels were the advanced student, the regular education student and the special education student. The

researcher administered the program in the same manner at all three levels. Adjustments were necessary at the special education level, however they were minor in nature. Additional time on task were necessary at the special education level.

The writer's program was implemented during the first ten minutes of each period at the target school. Daily assignments and tasks were done by the targeted students.

First a pre-test on measuring skills was given to the targeted students. The results have been analyzed for each class, an introductory lesson on measurement was given by the researcher at the target school.

Following the introductory lesson, the daily measuring tasks were implemented. Students were required to measure drawings and objects (Appendix B) and record their answers on a calendar designed for this program (Appendix B).

When all of the lessons were given for each unit, the students were tested. At the conclusion of the program, a post-test was given and the results are shown in table form.

The main focus of this study was to determine parts of an inch to the nearest sixteenth of an inch. The students were expected to measure accurately to the nearest sixteenth of an inch at the conclusion of the program.

The author taught six classes daily, one advanced, four regular education, and one special education. Comparisons were made between levels to determine the applicability of the program. Additionally, a further comparison was made between the two regular education classes. One group was given the practicum's program, while the other group did not receive any special instruction and continued as previously instructed.

The writer will now outline the procedure that was given to the targeted students.

Timeline

WEEK 1:	Day 1	Pre-test of measurement skills.
	Day 2	Introduction of English System, lecture.
	Day 3-4	Construction of an inch scale. Students drew a scale using graph paper.
	Day 5	Review
WEEK 2:	Day 6-9	Students measurement tasks to the nearest ½ of an inch. Drawings and patterns of wooden toys were used for performance task. Appendix B (p 54).
	Day 10	Students were given a line measurement task to the nearest ½ inch. Appendix B (p 57).
WEEK 3:	Day 11-14	Student measurement task to the nearest ¼ of an inch. Appendix B (p 59).
	Day 15	Students were given a line measurement test to the nearest ¼ of an inch. Appendix B(p 63).

WEEK 4: Day 16-19 Student measurement task to nearest ⅛ of an inch. Drawing and patterns of wooden toys were used for performance task. Appendix B (p 65).

Day 20 Students were given a line measurement test. Appendix B (p 69).

WEEK 5: Day 21-24 Student measurement task to the nearest 1/16 of an inch. Drawings and patterns of wooden toys were used for performance task. Appendix B (p 71).

Day 25 Students were given a line measurement test to the nearest 1/16 of an inch. Appendix B (p 75).

WEEK 6: Day 26-29 Student measurement tasks were given and students were required to record to the nearest part of an inch. Patterns, blocks, and handout of scales were used for this task. Students recorded and self-checked their own measurements. Appendix B (p 76).

Day 30 Post-test given to targeted students. Appendix B (p 80).

Students were exposed to the program at the beginning of each day for a period not to exceed 10 minutes. The target students were given drawings and objects to measure daily. Each individual recorded his/her answers on a calendar prepared by the researcher and they were checked daily. The students used a variety of measuring tools so they became familiar with measuring and marking tools that they used during the remainder of class time.

The total timeline for this program was six weeks. The researcher collected data daily and test data weekly. During the implementation period, the researcher monitored and adjusted the program when the data supported the need.

During the implementation of this program the researcher encountered several problems. The results of this program may have been better if all students would have been present for all of the required days. The researcher provided opportunities for those studnets who were absent to complete the assigned measurement tasks.

The special education class needed extra time on tasks in order to complete the daily assignment. The researcher noted a wide range of ability levels in the special education class. When possible, the researcher grouped the students by ability and used several students as tutors to help this class.

The researcher integrated this program into the existing Industrial Arts program at the target school whenever possible. The instruments used for measuring tasks were those that are commonly used in the Industrial Arts program. Such instruments as carpenter squares, try squares, folding rules, marking guages, combination squares and rulers were used as the measuring devices. All of these tools were in the English

System of measurement.

The researcher taught six classes daily during the implementation period. The schedule of classes and the times of those classes are listed in Table 1 (see Appendix B, p 83). The students listed in Table 1 (p 83) are those students who completed the program from Day 1 until Day 30. Those students who entered and withdrew from the course during the implementation period were not counted in the final results that are listed in Chapter IV.

Chapter IV Results

The main objective of this practicum was to instill a positive attitude into Industrial Arts students in the area of measurement skills. The Industrial Arts program at the target school has been popular, although, in the past, measurement skills were looked upon by the student as being a difficult task to master. Therefore the instructor developed patterns of use on projects that minimized the need for accurate measurement.

The program that this author implemented into the curriculum at the targeted school didn't allow the targeted students to use a pattern while building a project. Therefore the need for improved measurement skills were desired by the targeted student. There was no noticeable difference between

classes in the attitude toward measurement during the implementation period of the controlled and non-controlled groups. Therefore the researcher concludes that this program didn't have a negative effect on attitudes towards measurements. The researcher concludes this to mean the attitude toward measurement was improved compared to previous school years that the researcher taught at the targeted school.

The goal of this practicum was to have 75% of the targeted students demonstrate measurement skills with a 75% accuracy rate. The instrument used to ascertain if the targeted students achieved this goal was the post-test.

Table 1 (p 83) shows the different groups that were involved with this practicum. Period 1, 2, 3, 4 and 5 received the program designed by the researcher. These five groups are to be considered controlled groups. Period 6 was the uncontrolled group. This group received no additional instruction on measurement skills. All six groups used measuring tools that are used in the Industrial Arts curriculum. The first ten minutes of Period 1-5 were used for instructional time for the program. All periods made the same projects that were used in the existing curriculum. The

results of this program are listed by periods and type of class.

Table 2 (p 84), the gifted class, had 15 students complete the entire program. The results of each student are listed on Table 2. The class average on the pre-test as 67.6%. This is the highest average on the pre-test, however, these students have been exposed to the Industrial Arts program and were selected for the Gifted Industrial Arts class based on the previous years performance in Industrial Arts. At the conclusion of the program the class average was 85.2% with a 17.6% increase. This class meets the criteria for success. Seventy-five of the students scored 75% or better on the post-test.

Table 3 (p 85), the Period 2 class, had 12 students complete the entire program. The average score on the pre-test was 54%, the average score on the post-test was 73.3%. This class fell short of reaching the goal of this practicum.

Table 4 (p 86), the Period 3 class, had 17 students complete the entire program. The average score on the pre-test was 12%, the average score on the post-test was 81%. This class reached the success rate of 75% of students scoring 75% or better.

Table 5 (p 87), the Period 4 class, had an average score of 18.31% on the pre-test, the average score on the post-test was 76.81%. This class had an increase of 58.87% and reached the

goal of this practicum.

Table 6 (p 88), the Period 5 class, is made up of several types of learning disabilities and scored an average of 17% on the pre-test. The average score on the post-test was 69.93%. This class was allowed extra time on the task because of some special learning problems. However, this class fell short of the goal of the researcher.

Tables 7 and 8 (p 89) contain the combined results of all targeted students on these tables. The average of all targeted students on the pre-test was 33.92%, the average on the post-test was 77.24%. However, Table 8 shows that 53 of 75 students that were tested made a grade of 75% or better. The success rate as determined by the author is 56.25% students. Therefore, the program didn't reach the goal of 75% of the students receiving a 75% or better on the post-test.

However, the program did improve the rate of success an average of 43.32%. Table 9 (p 90) shows the results of the uncontrolled group. These students didn't receive any additional information on measurement skills. The results show the average pre-test score to be 39.5% and the average post-test score was 46.55%. The rate of improvement of this class was 7.05%.

Therefore the author concludes the targeted students improved at the rate of 43.32% on their measurement skills, while the uncontrolled class improved their measurement skills 7.05%. The program was successful at improving measurement skills however, the goal of 75% of the students scoring 75% on the post-test was not achieved.

Several factors may have influenced the final results.

1. Students absenteeism.
2. Student ability levels.
3. Attitude of program.
4. All student levels were grouped together.

Chapter V Recommendations

During the implementation of this program several recommendations should be noted to improve upon the final result:

First, during the implementation of the pre-test there should be no hint as to the nature of the test. This test should be given at the earliest possible time in order to determine the present knowledge of measurement skills.

Second, before implementation of the daily material make sure there is sufficient material for everyone and

tools should be readily available to all students if possible.

Third, when possible use both the drawings and actual patterns of the drawings being used. Hands-on experience seemed to be more readily accepted rather than use of only a drawing. Therefore, material such as patterns and blocks should be prepared, marked and labeled well in advance of the implementation period.

Fourth, the drawing and patterns that are shown in the appendices may be adapted to fit the need of the implementor. Drawings should be made by the implementor to correlate with the related curriculum at the intended school.

Fifth, the implementor should preview all materials before implementation of this program. Whenever possible the implementor should consult with other professionals in order to obtain any additional information that may be helpful.

The researcher is in the process of reviewing all materials and preparing a student booklet to be published by

the target district when funds become available. This hopefully will minimize the amount of daily preparation involved by the implementor. This booklet will be very useful for the purpose of an in-service workshop of other Industrial Arts teachers within the targeted district.

The final recommendation given by this researcher is set the the success rate of the program at a level which can be achieved if a near perfect environment is being tested. However, if success comes too early the value learned will be quickly forgotten and discarded. Trial and error is essential in order to achieve success.

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Heroes and Heroines of the Metric System, Middletown, Connecticut: Xerox Educational Publications. (Film Strip)

Metrics for Woodworking (1978). Encyclopedia Britannica Educational Corporation. (Film Strip)

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Psychology

Combs Arthur W., Richards Anne Cohen, Richards Fred. Perceptual Psychology. New York: Harper & Row, 1978.

This book shows results from the authors case studies on perceptual psychology. Several examples are compared and contrasted involving psychological behaviors.

Maslow, Abraham H. Motivation and Personality. New York: Harper & Row, 1970.

This book demonstrates human behavior and how individuals learn. The book breaks down the learning process into several age levels and tells of learning abilities at different age levels. This book was very helpful in the reasoning and techniques of teaching new materials and stimulus.

Piaget Jean, Inhelder Barbe. Szeminska Alina. The Child's Conception of Geometry. London: Routledge and Kegan Paul, 1966.

This book deals with hundreds of case studies involving the concept of geometry. Several chapters were devoted to the use of measuring skills. This book was very helpful to show the reason why children learn to measure.

Research

Bame, Allen E. Using Metrics in Industrial Arts. Virginia: Virginia Polytechic Institute and State University, 1979.

This report gives the history of the metric system. An attempt is made by the author to convert to the metric system in Industrial Arts curriculum.

DeSimone, Daniel V. Metric System Weights and Measures. Reprint from the World Book Encyclopedia.

This pamphlet lists the metric conversions and gives a brief history of the American attempt to convert to the metric system.

Hinrichs, Roy S. Improving Measuring Skills, Industrial Art Series (Tech. Rep No. 10,0004). Mississippi: Mississippi State Department of Education, Jackson Division.

This report outlines the measurement process for Industrial Arts courses. Emphasis is placed on accuracy as it relates to the manufacturing of a product.

Hughes, Larry R. Drafting. Texas: Department of Occupational Education and Technology, 1983.

This research report deals with drafting and how to instill accurate measurements on drawings. The report states the importance of accurate measurement and demonstrates the use of technical measuring instruments.

Schultz, Bob. Give Them a Container and They'll Take a Kilometer. Teacher.

This article deals with the United States attempt to convert to the metric system. Reasons are given as to the resistance to convert and why the metric system would benefit the United States.

Curriculum

Brown, Walter C. Blueprint Reading for Construction. Illinois: Goodheart-Wilcox, 1980.

This textbook points out the importance of accuracy when dealing with measurements in the construction industry. Linear measurement in the common or English system is stressed.

Brown, Walter C. Drafting. Illinois: Goodheart-Wilcox, 1985.

This textbook emphasizes the importance of dual dimensioning in the manufacturing industry. Both English and metric measurement systems are illustrated.

Foley Jack, Jacobs Wayne, Basten Elizabeth. Patterns and Discovery Measurement and Measures. Massachusetts: Addison-Wesley, 1970.

This workbook gives several examples and exercises to instill competency in measurement skills. Emphasis is placed on continuous practice and accuracy.

Foley Jack, Jacobs Wayne, Basten Elizabeth. Skills and Pattern Metric Geometry. Massachusetts: Addison-Wesley, 1970.

This workbook stresses the importance of accurate measurement. Problems involve both linear and angular measurement of objects.

Metrics for Woodworking. Encyclopaedia Britannica Educational Corporation, 1978.

This filmstrip shows how most woodworking tools could be converted to the metric system. The cost would be minimal for the local machine operators.

Spence, William P. Basic Industrial Drafting. Illinois: Chas A. Bennett, 1979.

This textbook stresses the dual dimensioning system for industrial drawing. Reasons are given for the practice which would benefit the U.S. economy in exportation of manufactured products.

Steinberg Joseph, Stempel Martin. Estimating for the Building Trades. Illinois: American Technical Publishers, 1982.

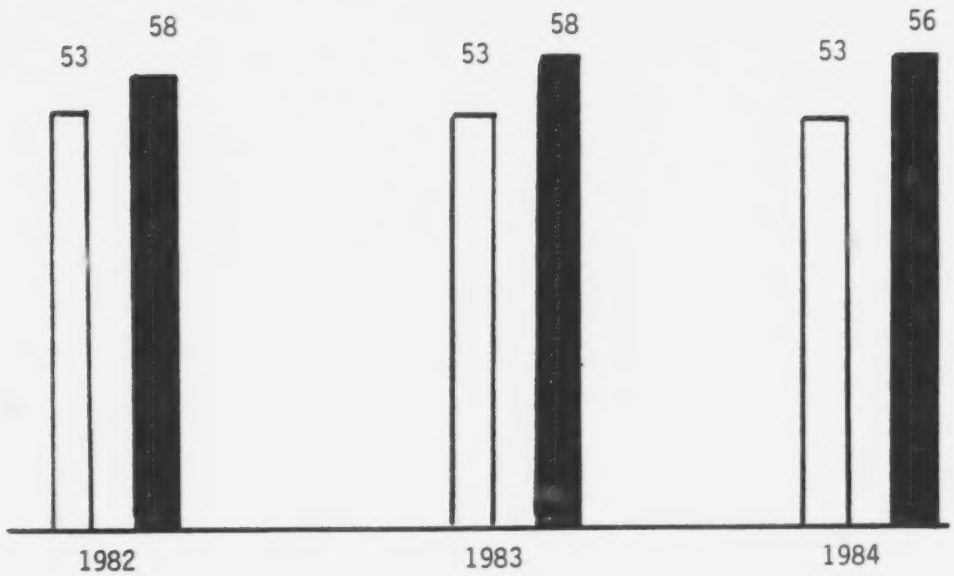
This textbook stresses the continued use of the English system of measurement. Estimations of construction materials is demonstrated for all phases of the construction industry. The author states conversion to the metric system would cause undue confusion in the construction industry.

APPENDIX A

CALIFORNIA ACHIEVEMENT TEST

MEASUREMENT

GRADE 7 LEVEL 7

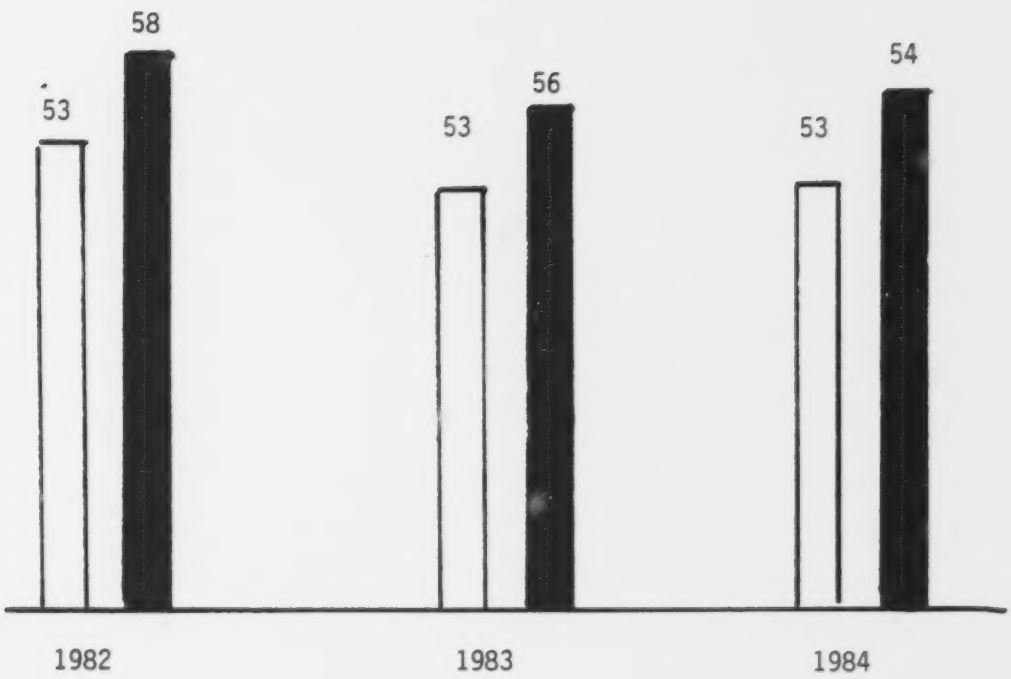


SCORES SHOW PERCENTAGE CORRECT

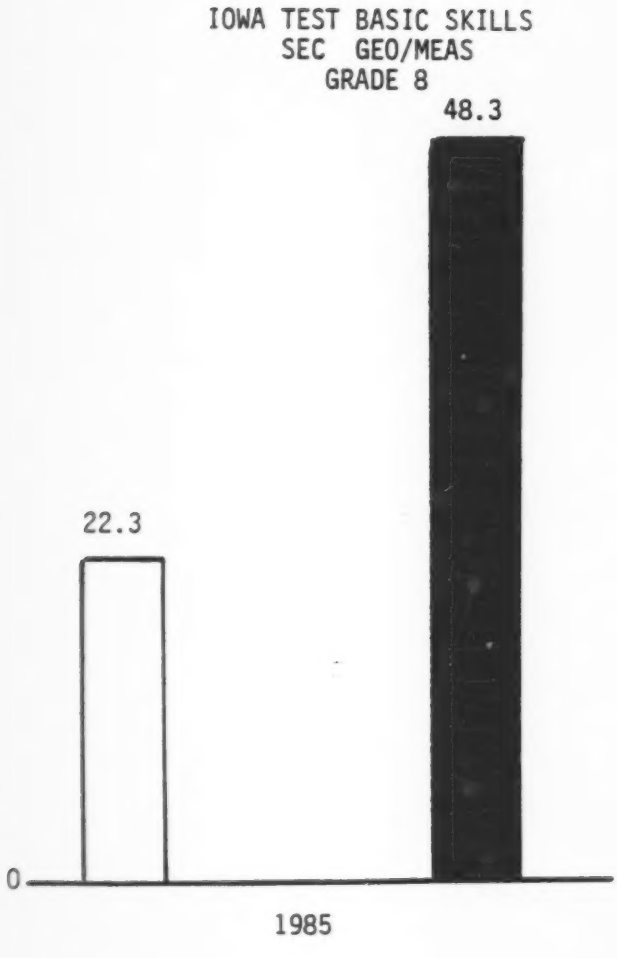
CALIFORNIA ACHIEVEMENT TEST

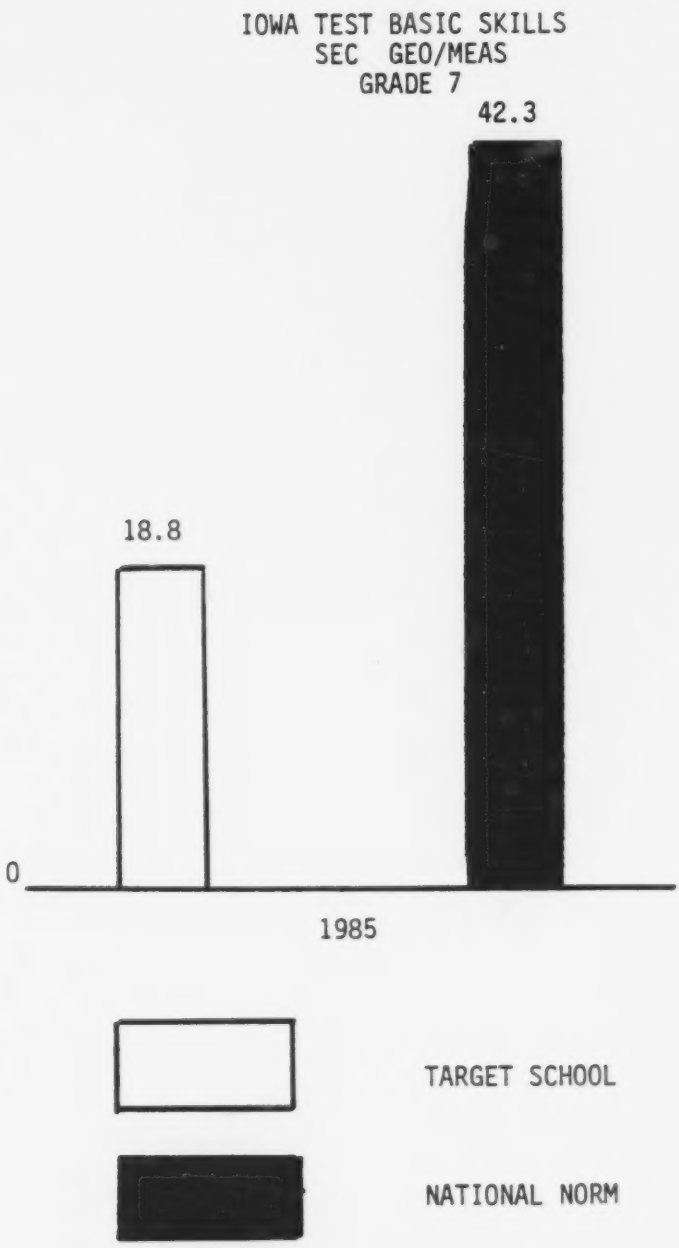
MEASUREMENT

GRADE 8 LEVEL 18



SCORES SHOW PERCENTAGE CORRECT

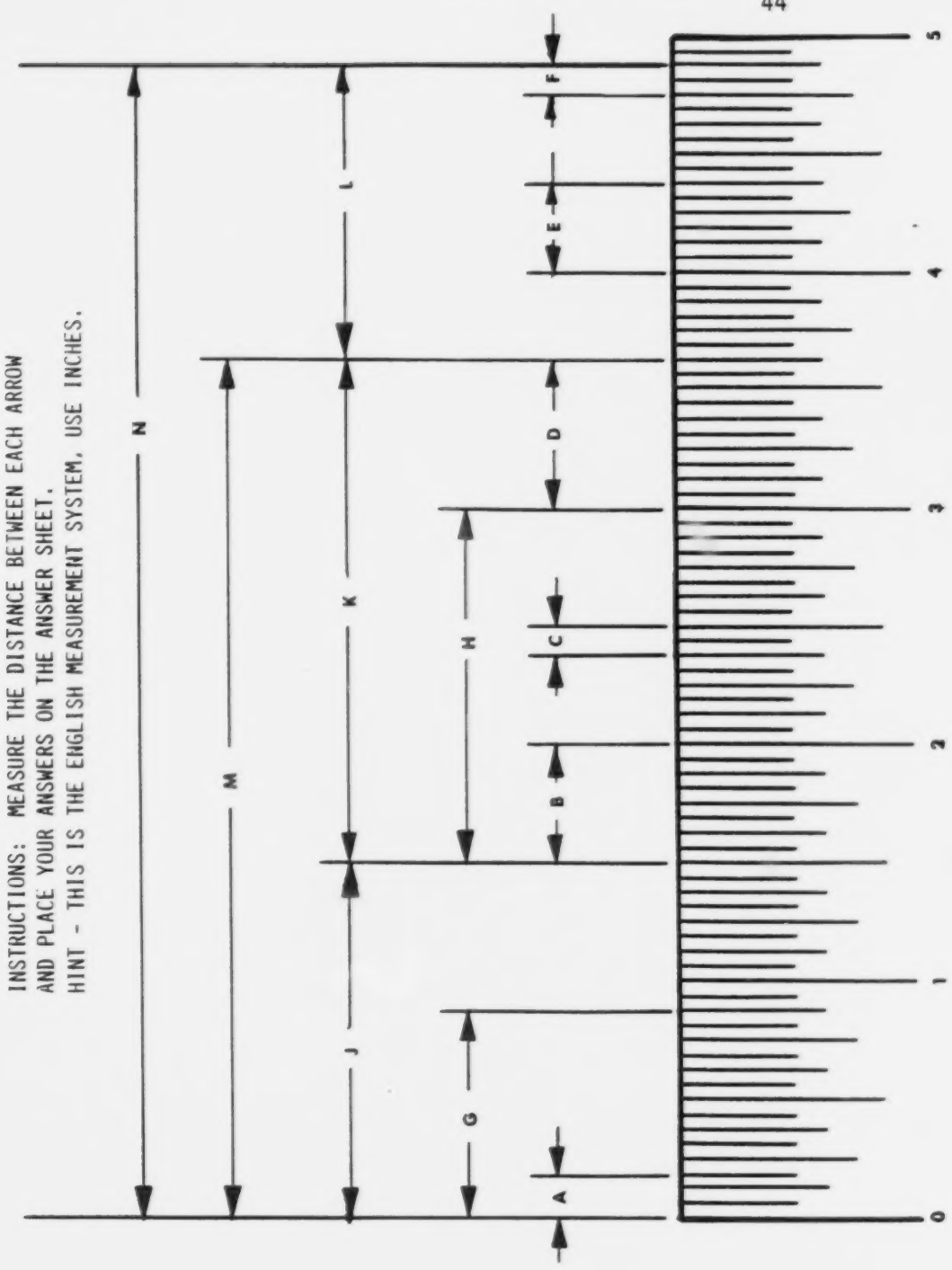

IOWA TEST BASIC SKILLS
SEC GEO/MEAS
GRADE 8
48.3
22.3
0
1985
TARGET SCHOOL
NATIONAL NORM
SCORES SHOW PERCENTAGE CORRECT



SCORES SHOW PERCENTAGE CORRECT

APPENDIX B

English Measurement System
44



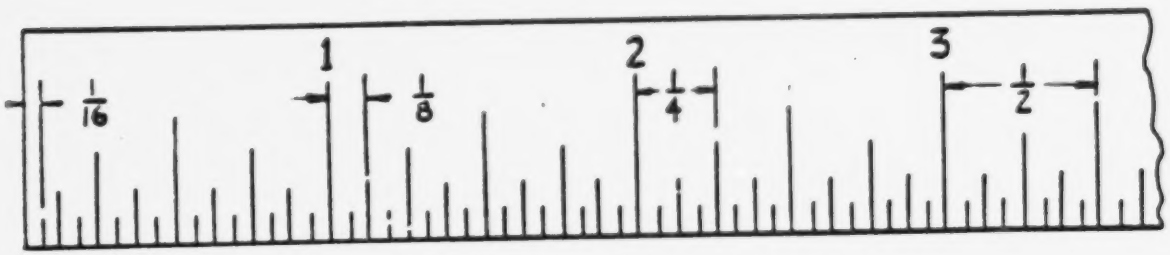
PRE-TEST

DAY 1

LESSON PLAN #1

Rulers come in different lengths. Some are one foot long, some three feet long, some eight feet long (folding rules), and some are as long as 100 feet (called tapes). Regardless of the length of the ruler, they are divided the same way.

Most rulers are divided into sixteenths of an inch.



The longest lines on the ruler are the inch marks, and they are numbered.

The half inch lines are the next longest, followed by the fourths, eighths, and then the sixteenths which are the shortest lines.

The distance between any two consecutive lines on the ruler is 1/16 of an inch.

NOTE: TO BE USED WITH A MEASURING TOOL IN THE INDUSTRIAL ART LAB

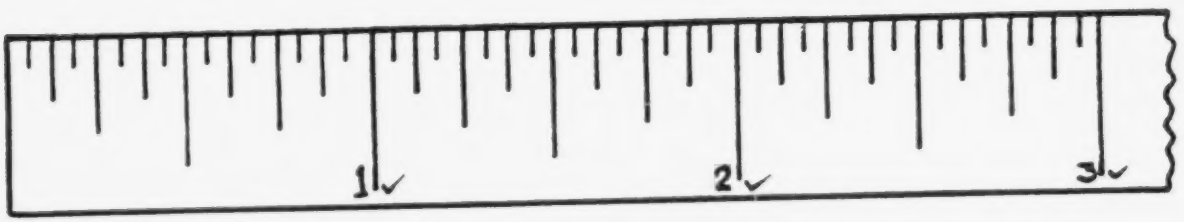
DAY 2

LESSON PLAN #2

On all one-foot rulers, yard sticks, folding rulers, and tapes the inch marks are identified by numbers. The distance from the end of the ruler to any number on the ruler is the length in inches.

To measure two inches, for example, begin at the end of the ruler and locate the number 2. That distance, from end to number 2, is two inches.

The inch marks on a ruler are checked below.



DAY 3

DAY 3

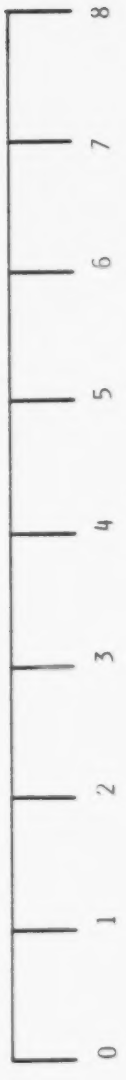
BLANK WORKSHEET GIVEN TO STUDENTS ON FIRST DAY
TO BE FILLED OUT DAILY AS PER WORKSHEET EXAMPLES
1/4" GRAPH PAPER SHOULD BE USED FOR THE BEST RESULTS

WORKSHEET #1

BUILDING A RULER

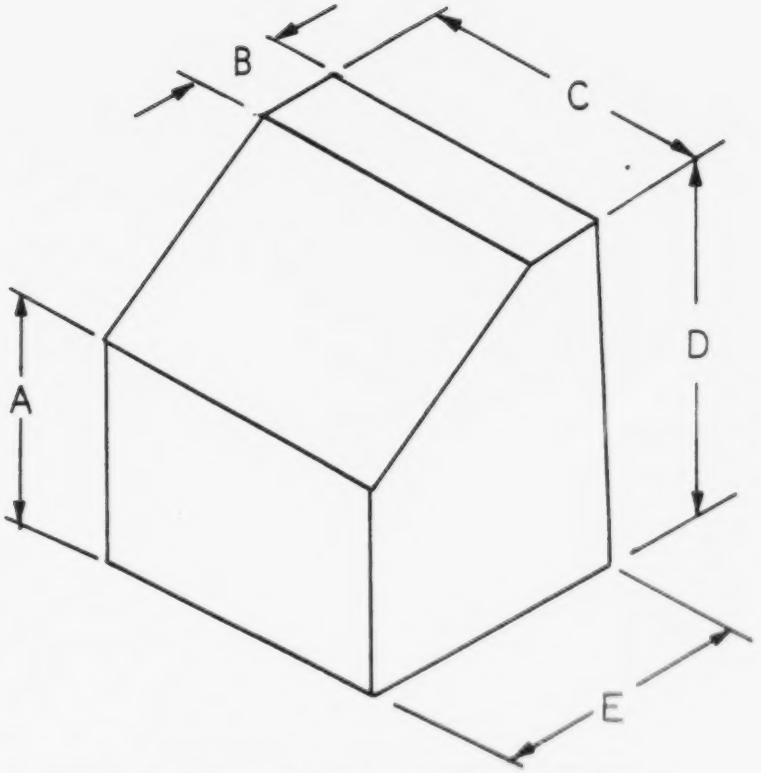
1 INCH WHOLE NUMBERS

ACTUAL SIZE



STUDENT ACTIVITY: DRAW 8 INCH MARKS

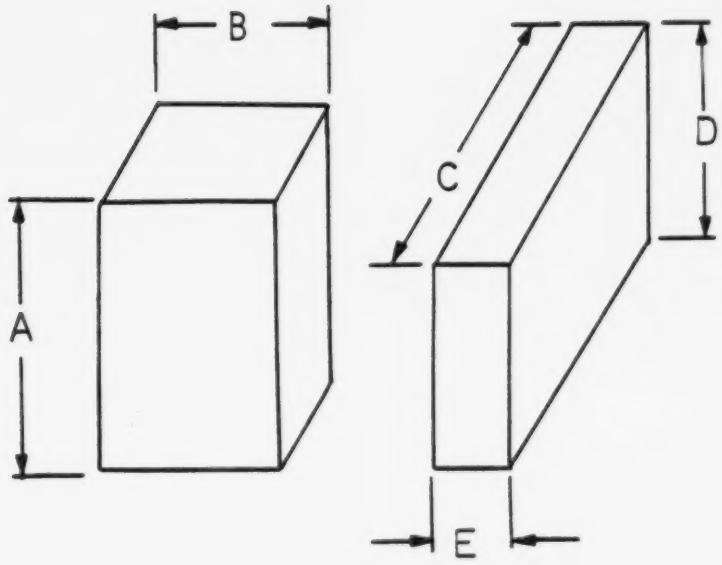
DAY 3



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST ____ OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DRAWINGS & BLOCKS OF WOOD

DAY 4



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST ____ OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

COMPARISON OF SIZES AND SHAPES
(ANY SIZE BLOCK CAN BE SUBSTITUTED)

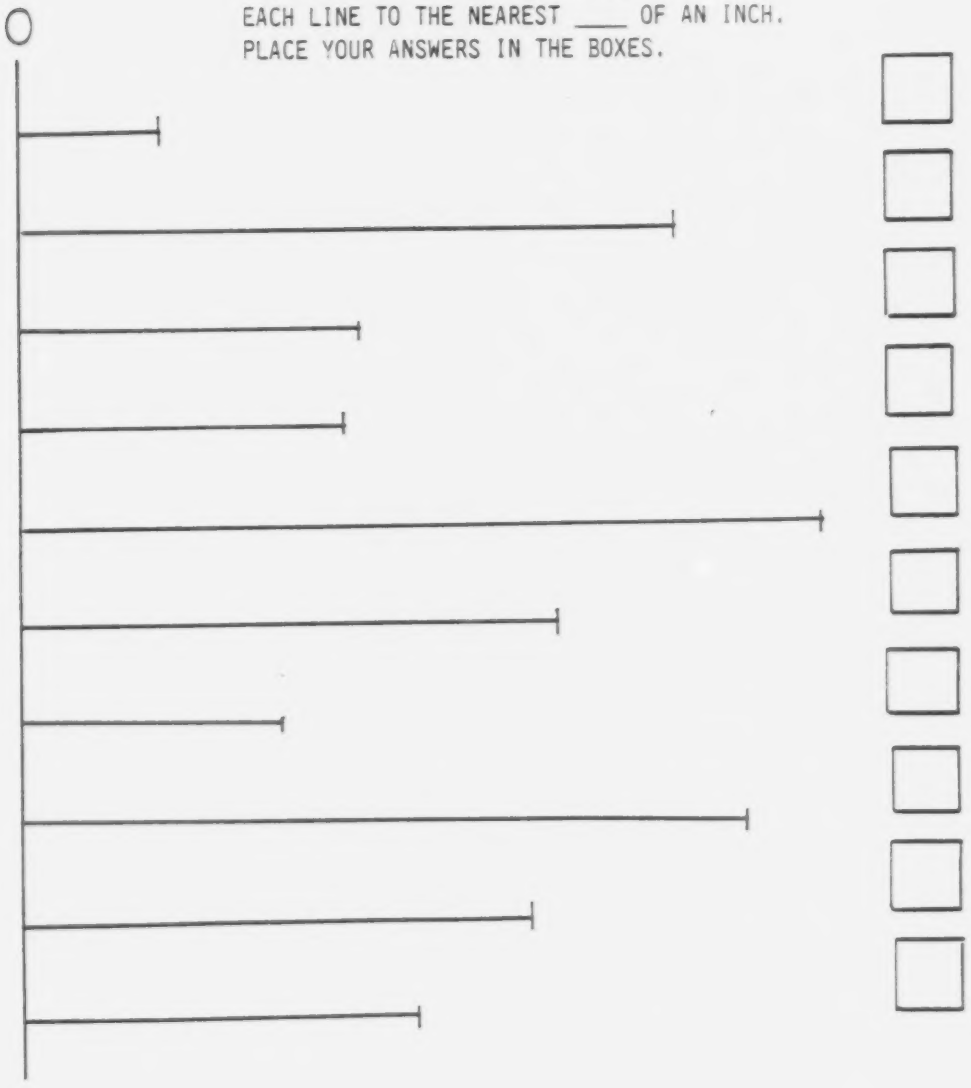
DAY 4

English Measurement System

51

MEASUREMENT TEST NO 1

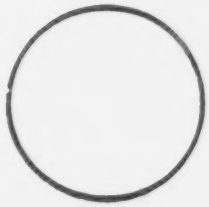
INSTRUCTIONS: MEASURE THE LENGTH OF EACH LINE TO THE NEAREST ____ OF AN INCH. PLACE YOUR ANSWERS IN THE BOXES.



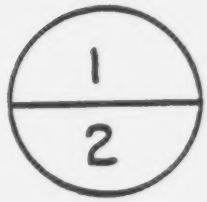
DAY 5

LESSON PLAN #3

ONE-HALF INCH

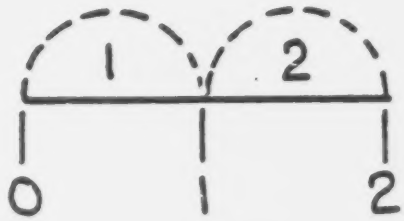


Step 1
Think of a whole pie as being the same as one inch.



Step 2
Imagine that the pie is sliced into 2 equal parts (called halves).

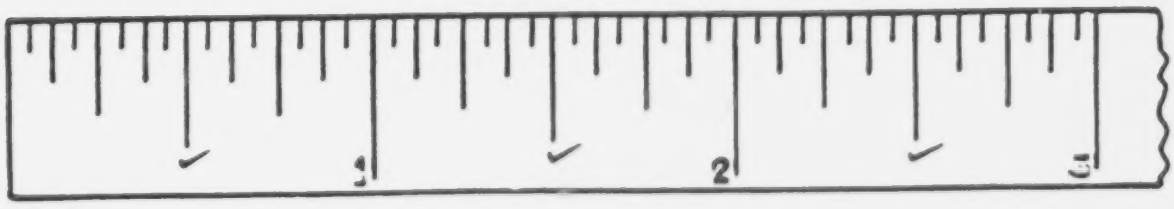
Step 3
Now picture the 2 slices of the pie arranged into this position. The base line of the pie (which equals one inch) is now divided into halves.



Step 4
Let's make a one-inch ruler from this base line. It will look like this.

Step 5
When measuring always start at 0 and:
One Part = 1/2 inch
Two Parts = 2/2 or 1 inch

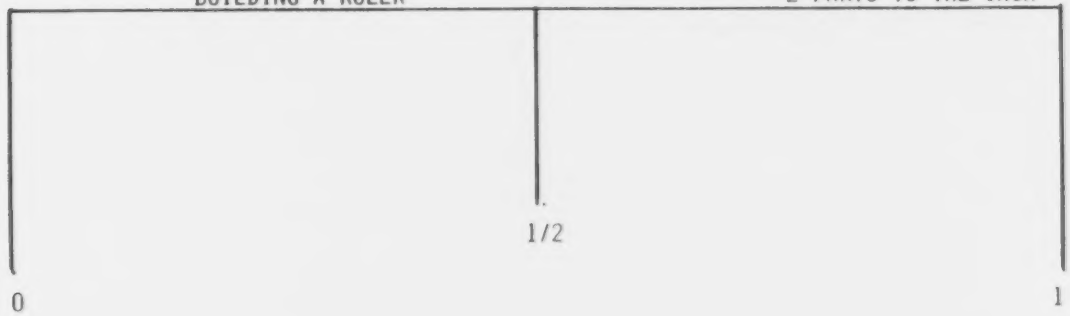
Step 6
The half inch marks on a ruler are checked below.



DAY 6

BUILDING A RULER

2 PARTS TO THE INCH

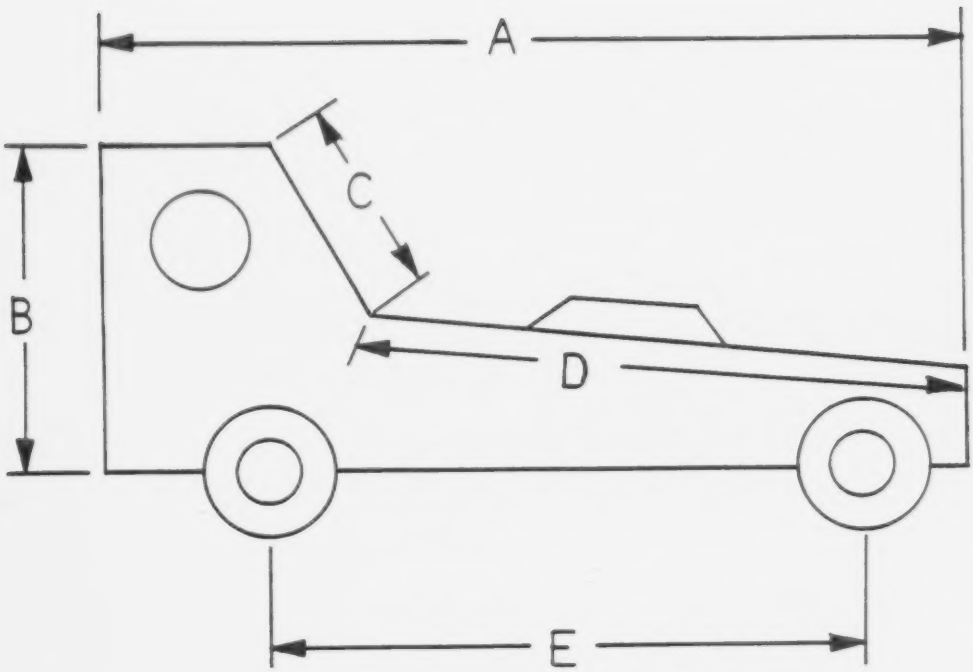


WHOLE NUMBERS = 1 FULL INCH LONGEST LINE ON SCALE
1/2" MARKS = LONGEST LINE BETWEEN WHOLE NUMBERS

ACTUAL SIZE

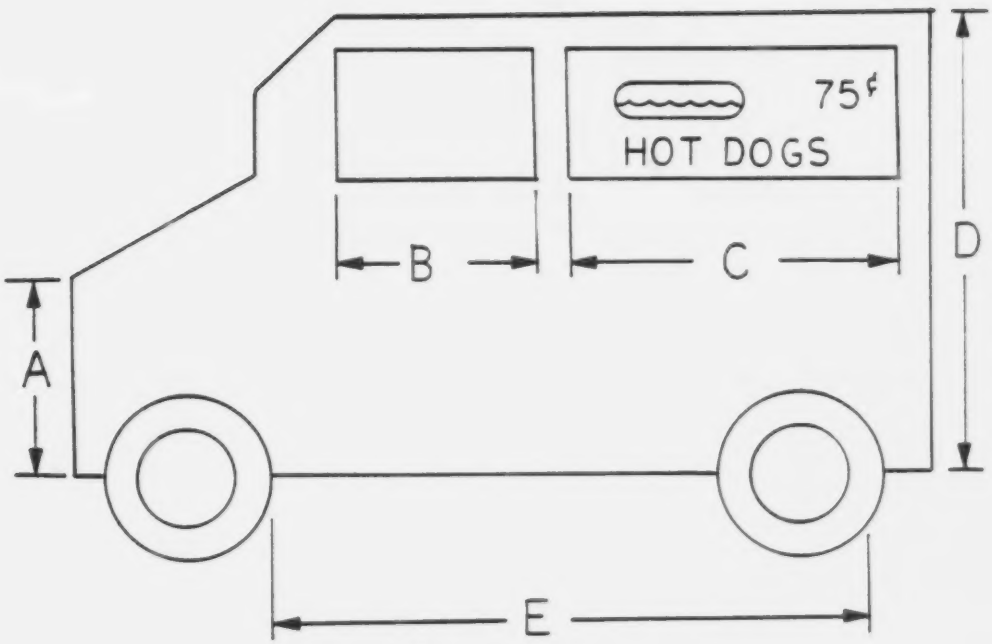
DRAW 1/2" MARKS ON SCALE

WORKSHEET #2



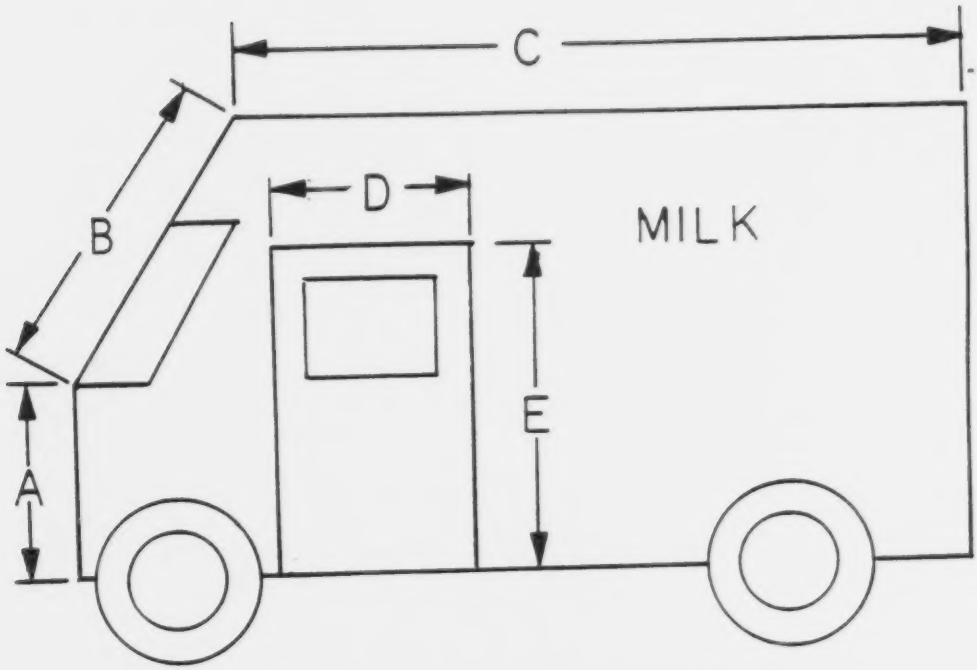
INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST ½ OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 7



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST ½ OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 8



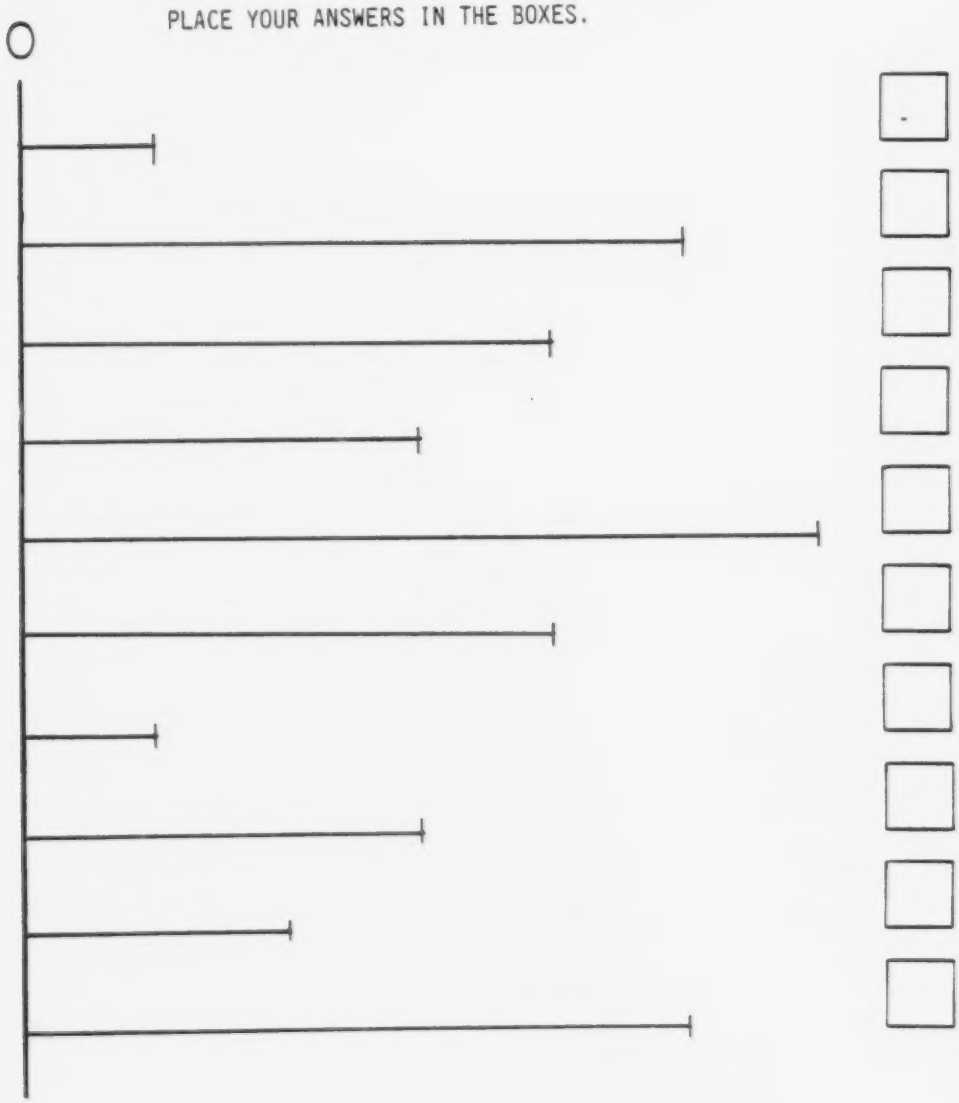
INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST ½ OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 7

English Measurement System
57

MEASUREMENT TEST NO 2

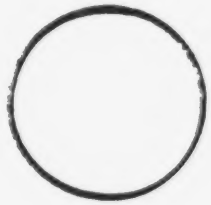
INSTRUCTIONS: MEASURE THE LENGTH OF EACH LINE TO THE NEAREST ½ OF AN INCH. PLACE YOUR ANSWERS IN THE BOXES.



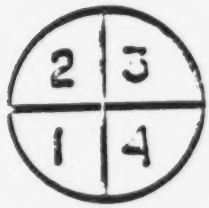
DAY 10

LESSON PLAN #4

Step 1
Think of a whole pie as being the same as one inch.

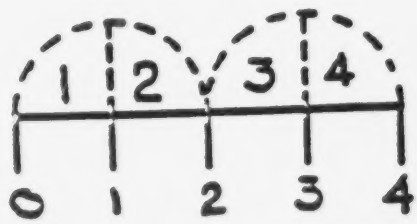


Step 2
Imagine that the pie is sliced into 4 equal parts (called fourths or quarters).



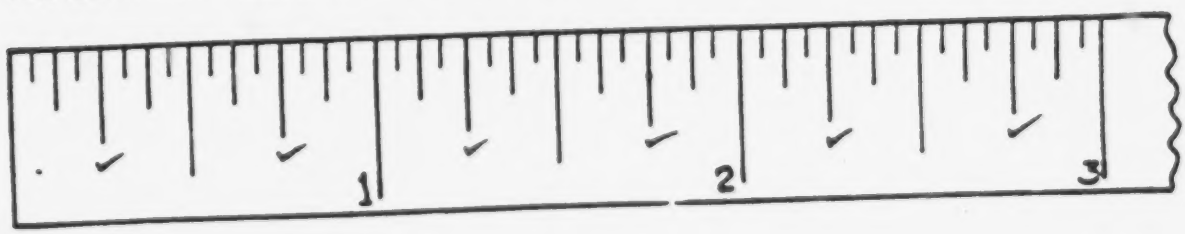
Step 3
Now picture the 4 slices of the pie arranged into this position. The base line of the pie (which equals one inch) is now divided into fourths.

Step 4
Let's make a one-inch ruler from this base line. It will look like this.

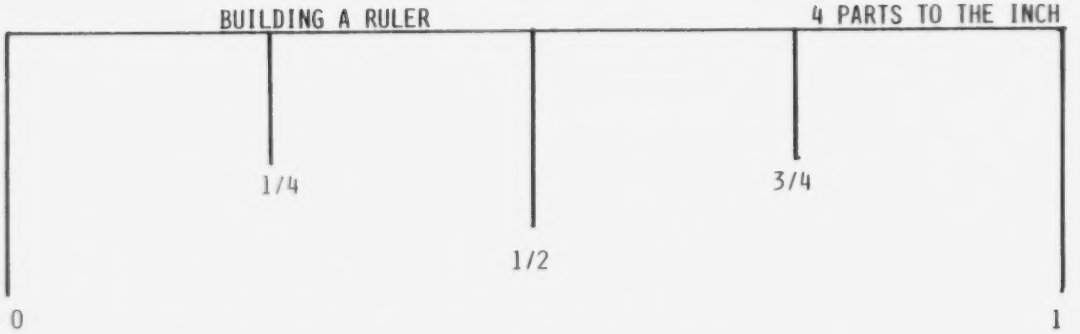


Step 5
When measuring always start at 0 and:
One Part = 1/4 inch
Two Parts = 2/4 inch or 1/2 inch
Three Parts = 3/4 inch
Four Parts 4/4 inch or 1 inch

Step 6
The fourth inch marks on a ruler are checked below.



DAY 11



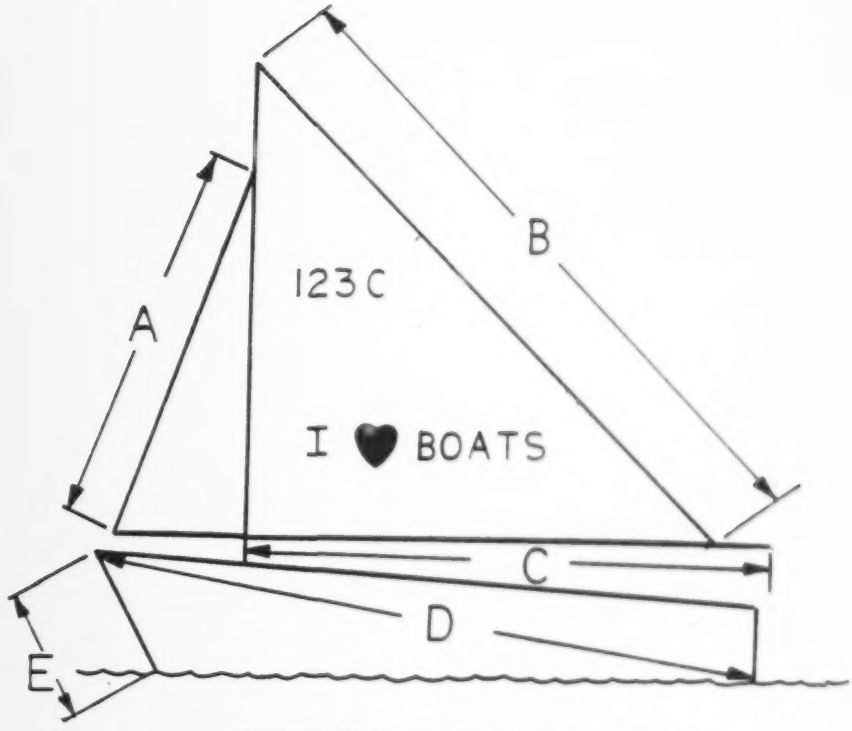
WHOLE NUMBER = 1 FULL INCH LONGEST LINE ON SCALE
1/2" MARKS = LONGEST LINE BETWEEN WHOLE NUMBERS
1/4" = LONGEST LINE BETWEEN 1/2" MARKS

ACTUAL SIZE

DRAW 1/4" MARKS ON SCALE

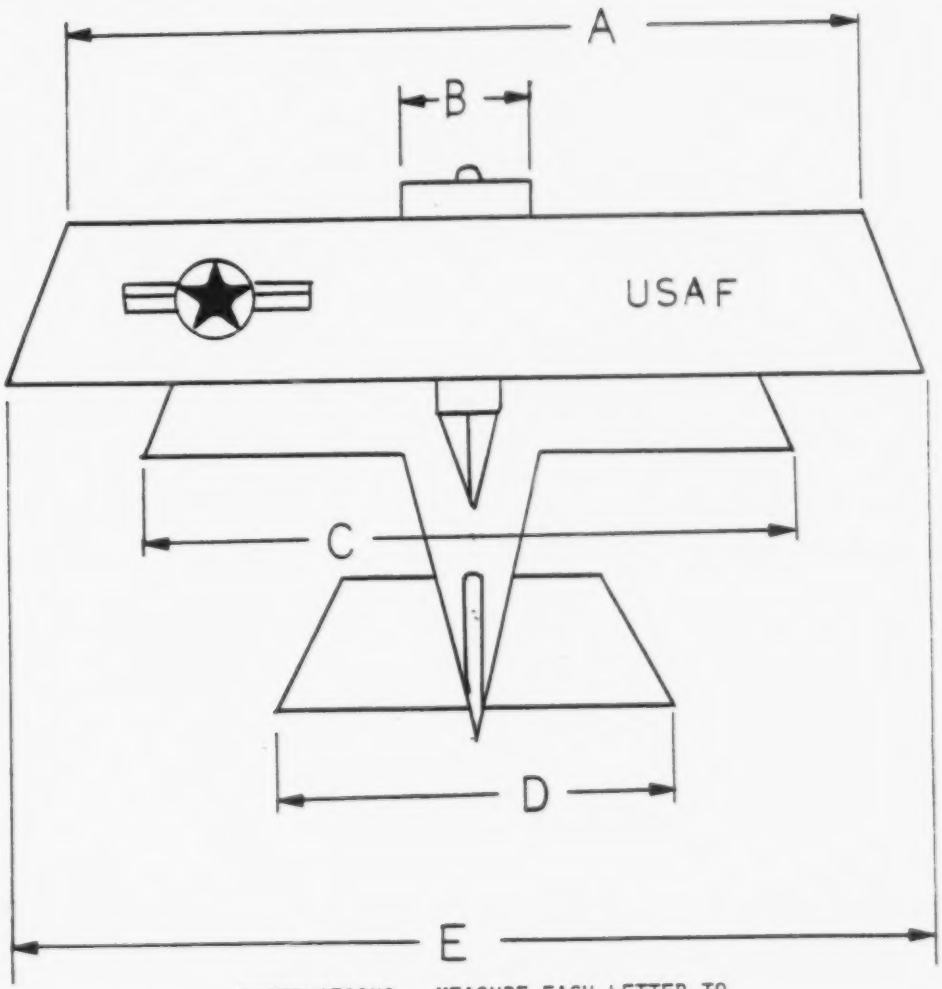
WORKSHEET #3

DAY 11



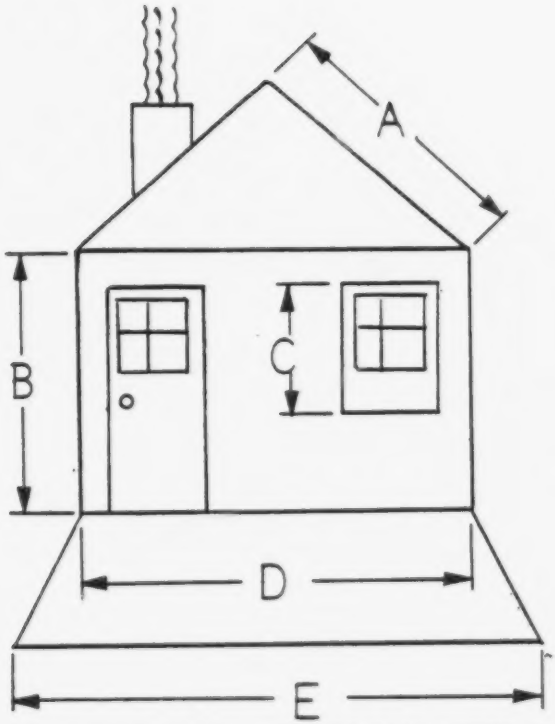
INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/4 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 12



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/4 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 13



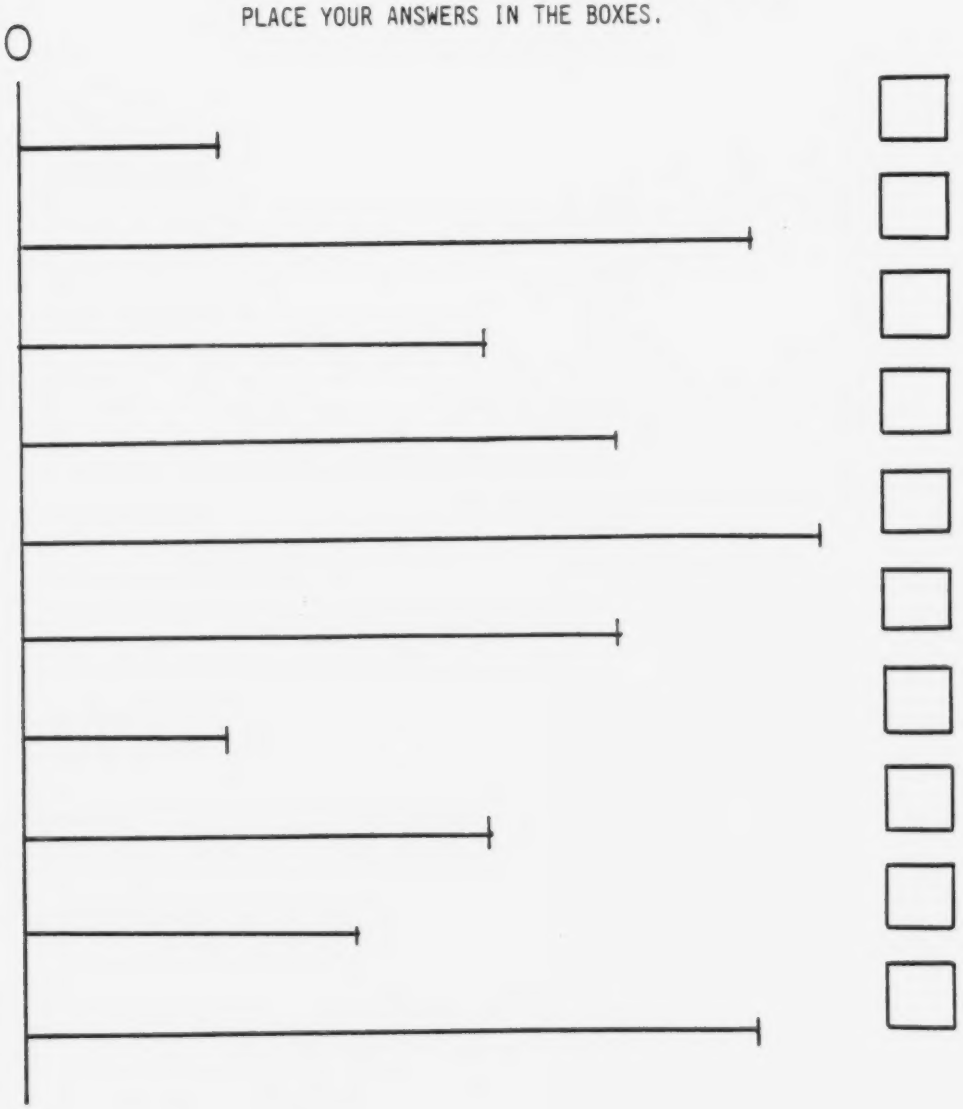
INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/4 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 14

English Measurement System
63

MEASUREMENT TEST NO 3

INSTRUCTIONS: MEASURE THE LENGTH OF EACH LINE TO THE NEAREST 1/4 OF AN INCH. PLACE YOUR ANSWERS IN THE BOXES.

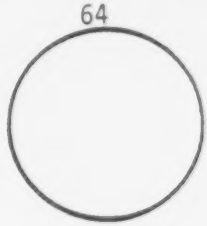


DAY 15

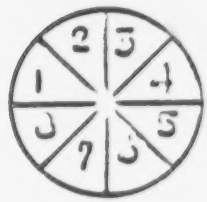
64

LESSON PLAN #5
ONE-EIGHTH INCH

Step 1
Think of a whole pie as being the same as one inch.



Step 2
Imagine that the pie is sliced into 8 equal parts (called eighths).

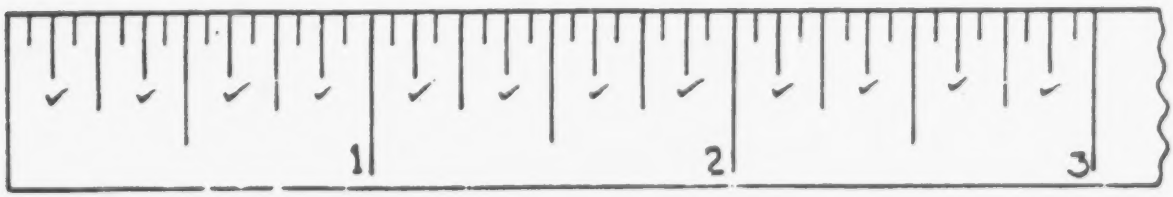


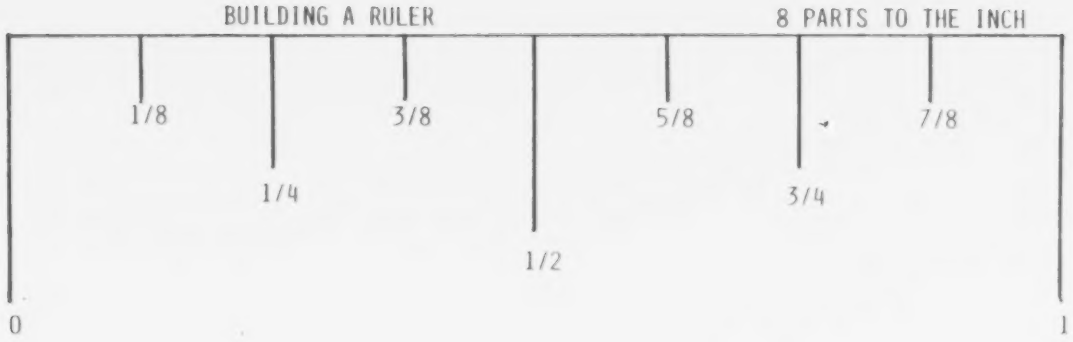
Step 3
Now picture the 8 slices of the pie arranged into this position; the base line of the pie (which equals one inch) is now divided into eighths.

Step 4
Let's make a one-inch ruler from this base line. It will look like this.

Step 5
When measuring always start at 0 and:
One Part = 1/8 inch
Two Parts = 2/8 inch or 1/4 inch
Three Parts = 3/8 inch
Four Parts 4/8 inch or 1/2 inch
Eight Parts = 8/8 inch or 1 inch

Step 6
The eighth inch marks on a ruler are checked below.



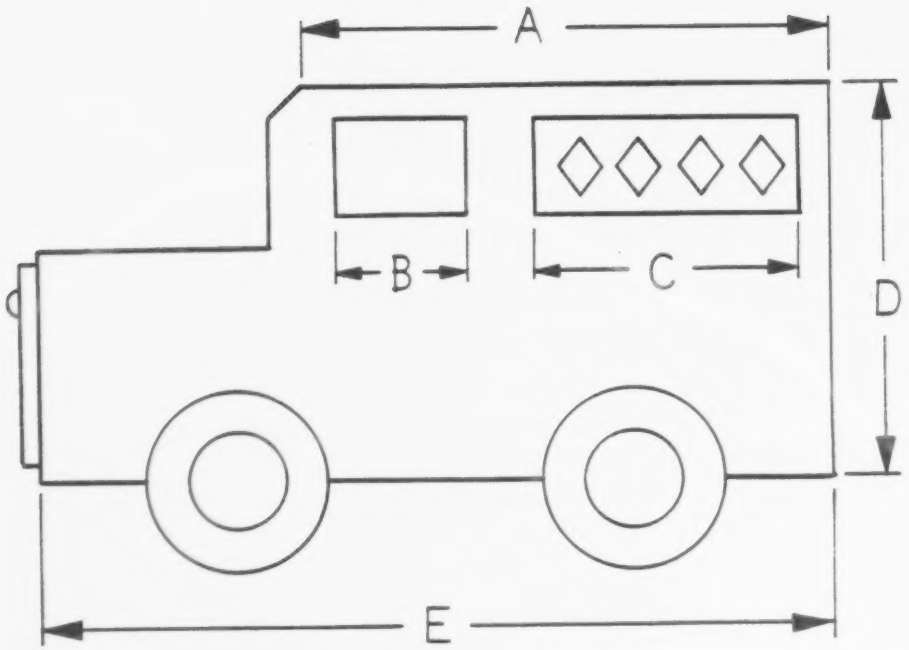


WHOLE NUMBERS = 1 FULL INCH LONGEST LINE ON SCALE
1/2" MARKS = LONGEST LINE BETWEEN WHOLE NUMBERS
1/4" MARKS = LONGEST LINE BETWEEN 1/2" MARKS
1/8" MARKS = LONGEST LINE BETWEEN 1/4" MARKS

ACTUAL SIZE

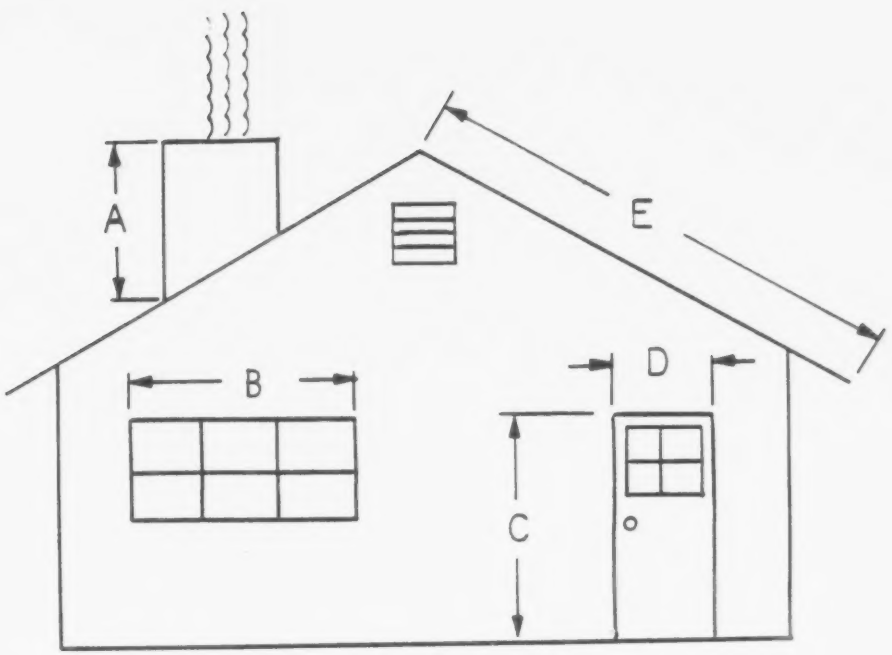
DRAW 1/8" MARKS ON SCALE

WORKSHEET #4



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/8 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 17

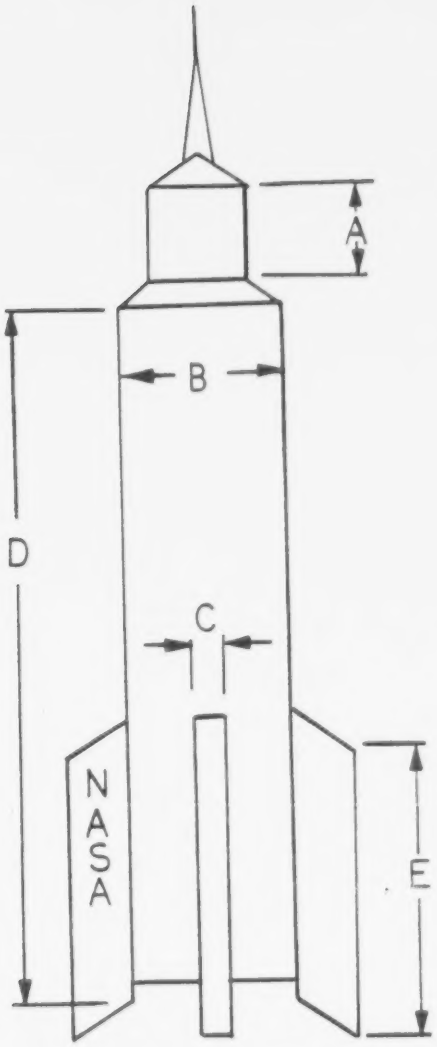


INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST ___ OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 18

English Measurement System

68



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/16 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

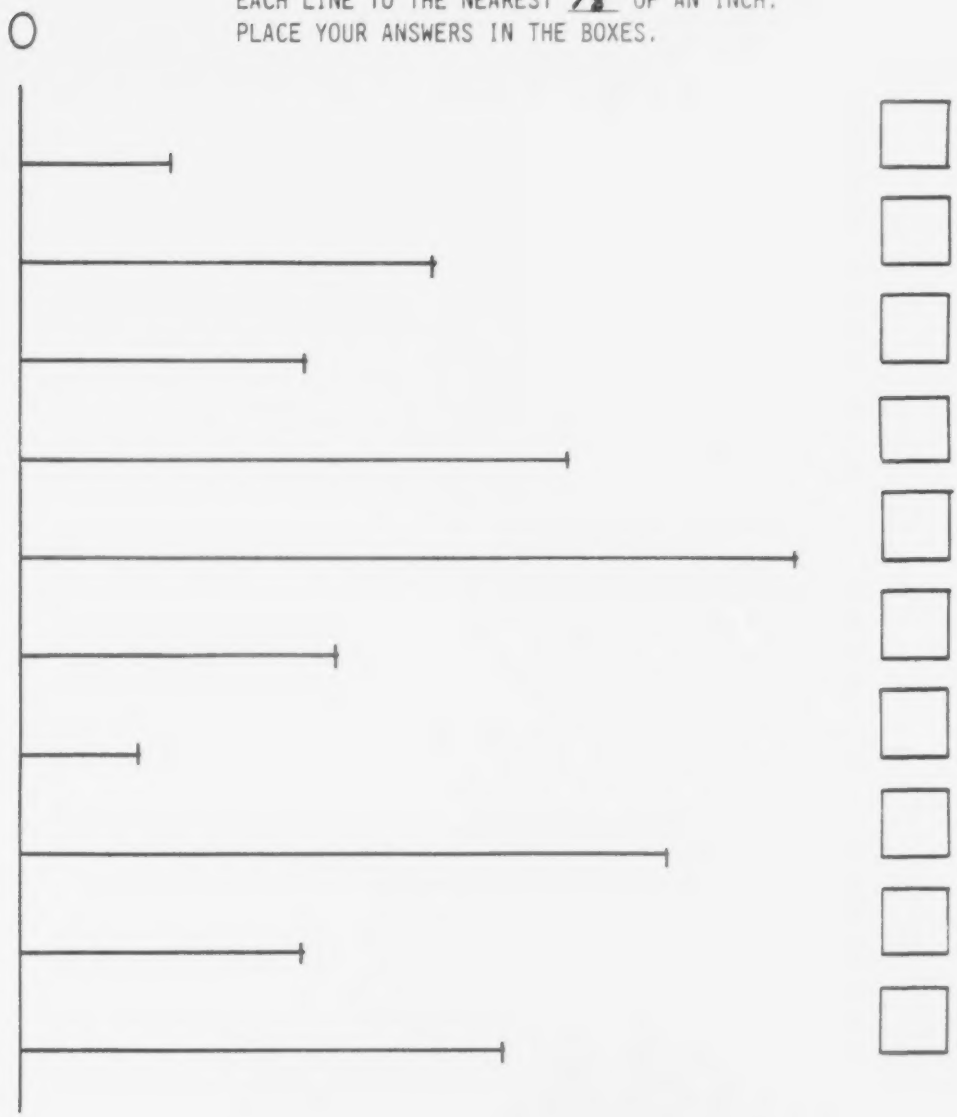
DAY 19

English Measurement System

69

MEASUREMENT TEST NO 4

INSTRUCTIONS: MEASURE THE LENGTH OF EACH LINE TO THE NEAREST 1/8 OF AN INCH. PLACE YOUR ANSWERS IN THE BOXES.

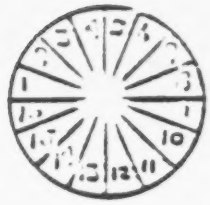


DAY 20

LESSON PLAN #6

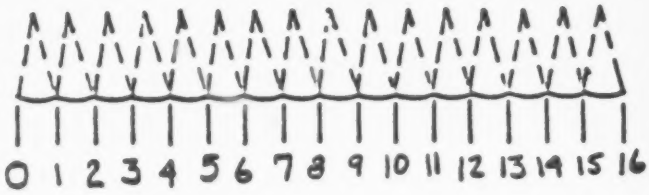
Step 1
Think of a whole pie as being the same as one inch.

Step 2
Imagine that the pie is sliced into 16 equals parts (called sixteenths).



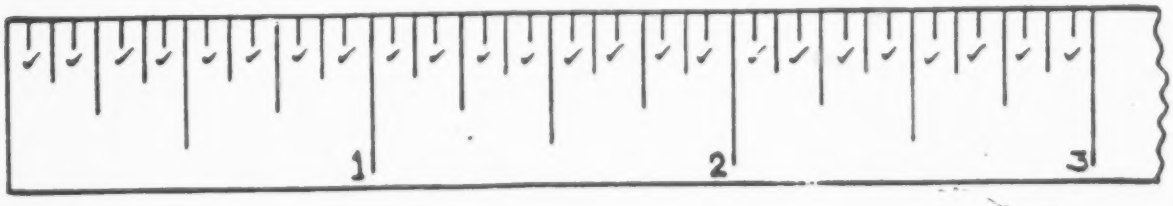
Step 3
Now picture the 16 slices of the pie arranged into this position: the base line of the pie (which equals one inch) is now divided into sixteenths.

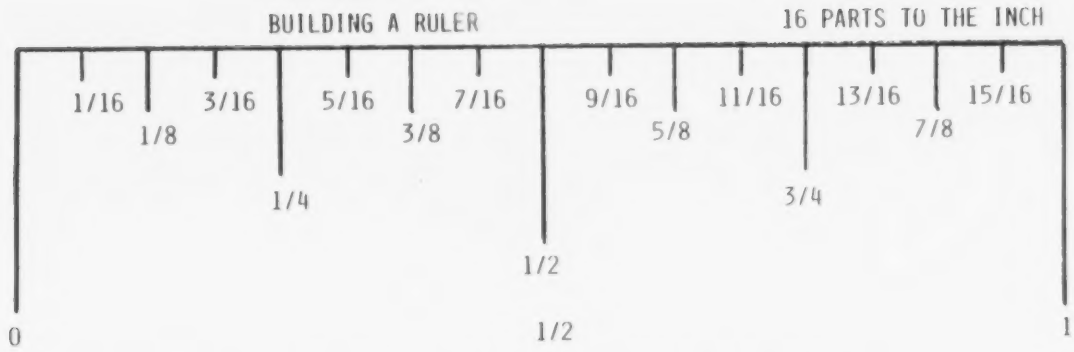
Step 4
Let's make a one-inch ruler from this base line. It will look like this.



Step 5
When measuring always start at 0 and:
One Part = 1/16 inch
Two Parts = 2/16 inch or 1/8 inch
Three Parts = 3/16 inch
Four Parts = 4/16 inch or 1/4 inch
Sixteen Parts = 16/16 inch or 1 inch

Step 6
The sixteenth inch marks on a ruler are checked below.



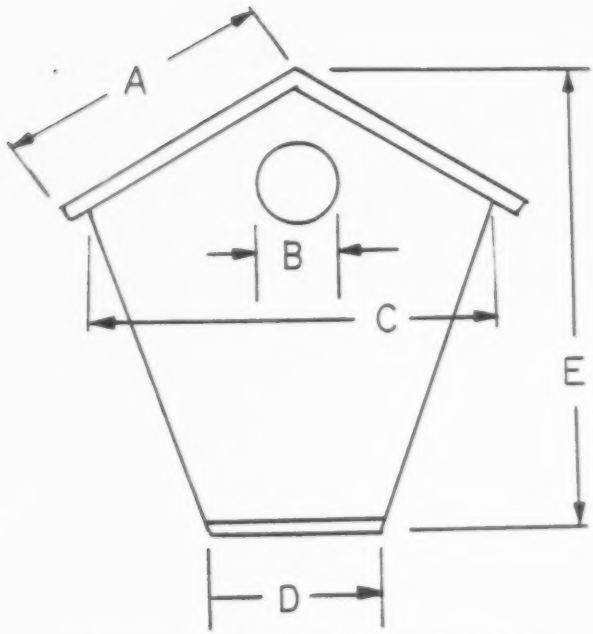


WHOLE NUMBER = 1 FULL INCH LONGEST LINE ON SCALE
1/2" MARKS = LONGEST LINE BETWEEN WHOLE NUMBERS
1/4" MARKS = LONGEST LINE BETWEEN 1/2" MARKS
1/8" MARKS = LONGEST LINE BETWEEN 1/4" MARKS
1/16" MARKS = SHORTEST LINE BETWEEN 1/4" MARKS

ACTUAL SIZE

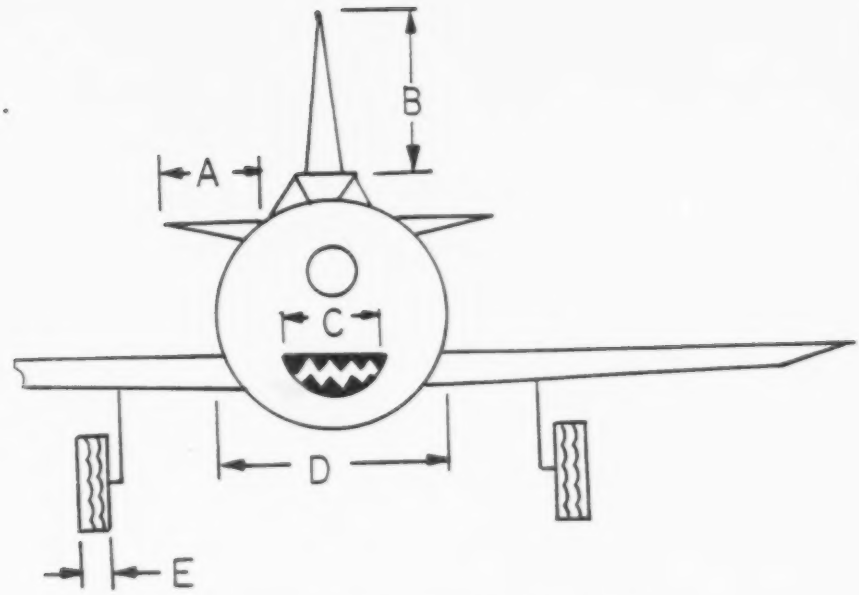
DRAW 1/16" MARK ON SCALE

WORKSHEET #5



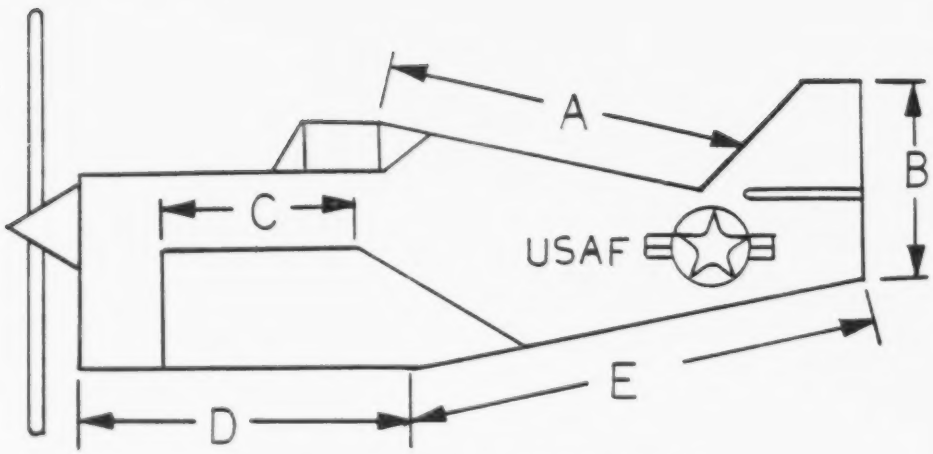
INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/16 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 22



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/16 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 23



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST 1/16 OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

DAY 24

English Measurement System

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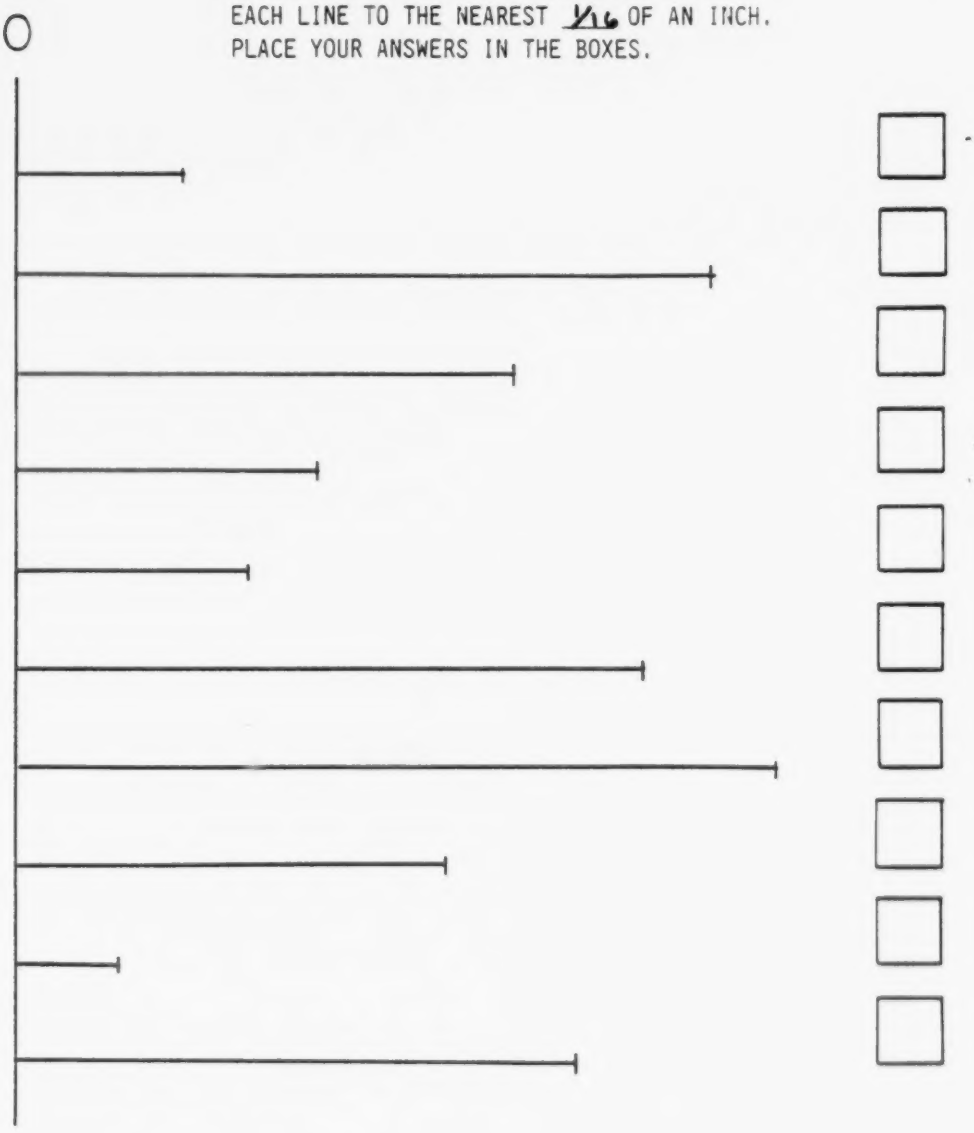
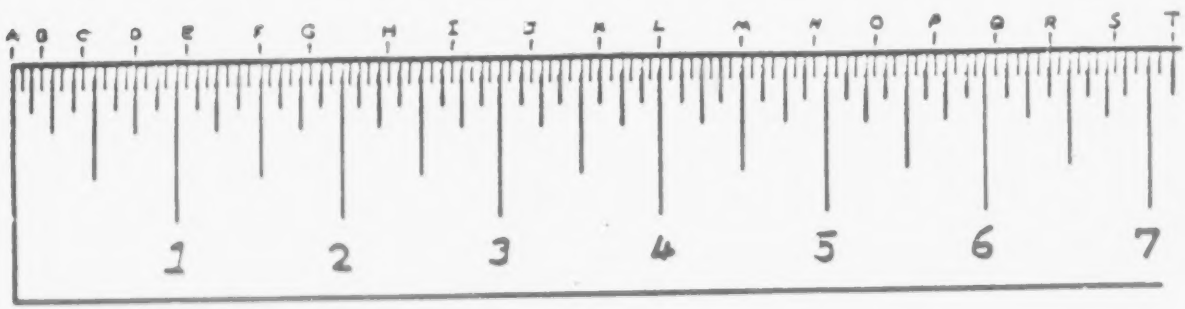
MEASUREMENT TEST NO 5

INSTRUCTIONS: MEASURE THE LENGTH OF EACH LINE TO THE NEAREST 1/16 OF AN INCH. PLACE YOUR ANSWERS IN THE BOXES.



DAY 25

DIRECTIONS: The ruler shown below is divided into sixteenths of an inch. You are to record the measurement from one point on the ruler to another point on the ruler. For example, the measurement between points A-D is 3/4 inch. Below the ruler you will find several distances that you need to measure. Record your answer in the blank space to the right of the identified points.



A-B _____
A-C _____
A-D _____
A-E _____
A-F _____
A-G _____

A-H _____
A-I _____
A-J _____
A-K _____
A-L _____
A-M _____

A-N _____
A-O _____
A-P _____
A-Q _____
A-R _____
A-S _____

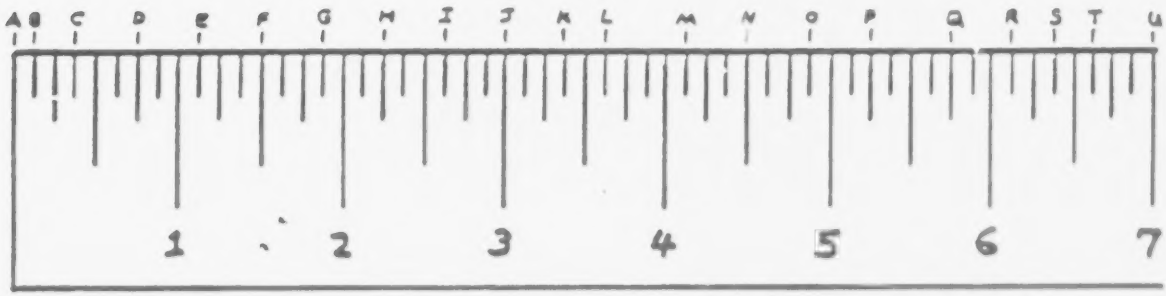
A-T _____
B-F _____
E-G _____
H-J _____
I-J _____
J-M _____

L-M _____
M-O _____
N-O _____
P-R _____
Q-R _____
S-T _____

EXERCISE #1

DAY 26

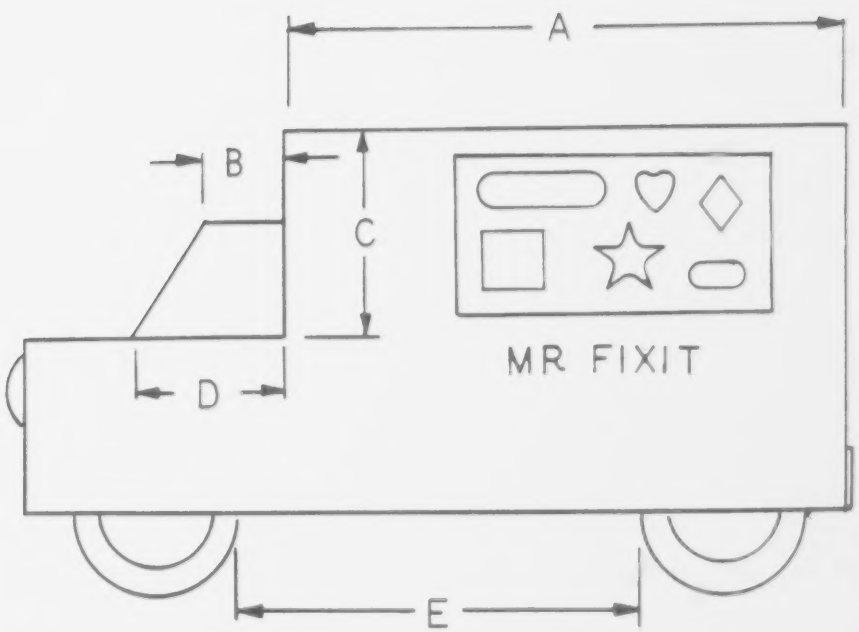
DIRECTIONS: The ruler shown below is divided into eighths of an inch. You are to record the measurement from one point on the ruler to another point on the ruler. For example, the measurement between points A-D is 3/4 inch. Below the ruler you will find several distances that you need to measure. Record your answer in the blank space to the right of the identified points.



A-B _____	A-H _____	A-N _____	A-T _____	J-L _____
A-C _____	A-I _____	A-O _____	B-C _____	M-C _____
A-D _____	A-J _____	A-P _____	C-E _____	P-Q _____
A-E _____	A-K _____	A-Q _____	D-G _____	R-T _____
A-F _____	A-L _____	A-R _____	D-K _____	R-U _____
A-G _____	A-M _____	A-S _____	H-L _____	T-U _____

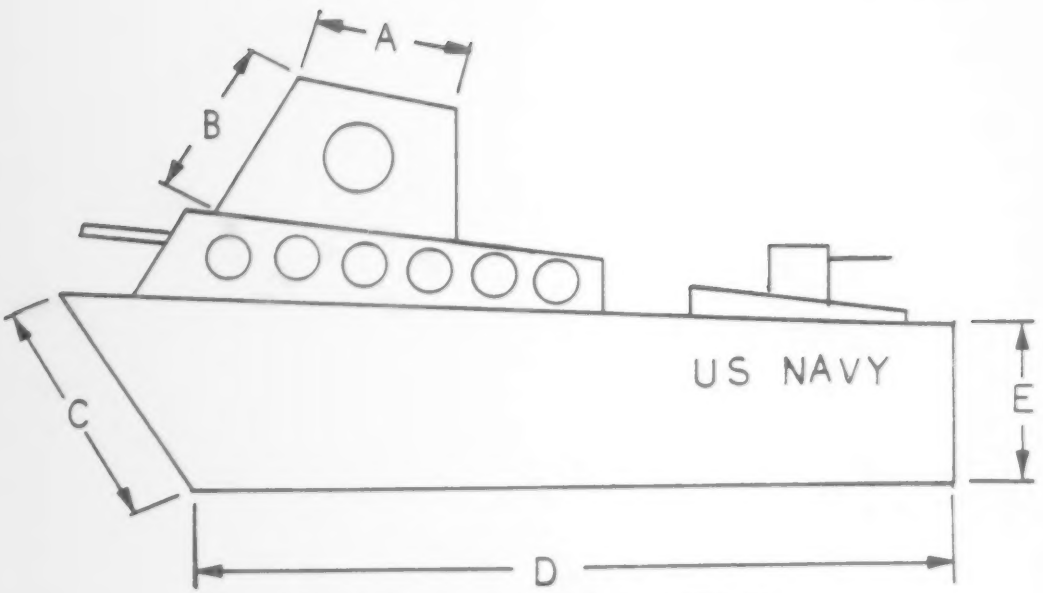
EXERCISE #2

DAY 27



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST part OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

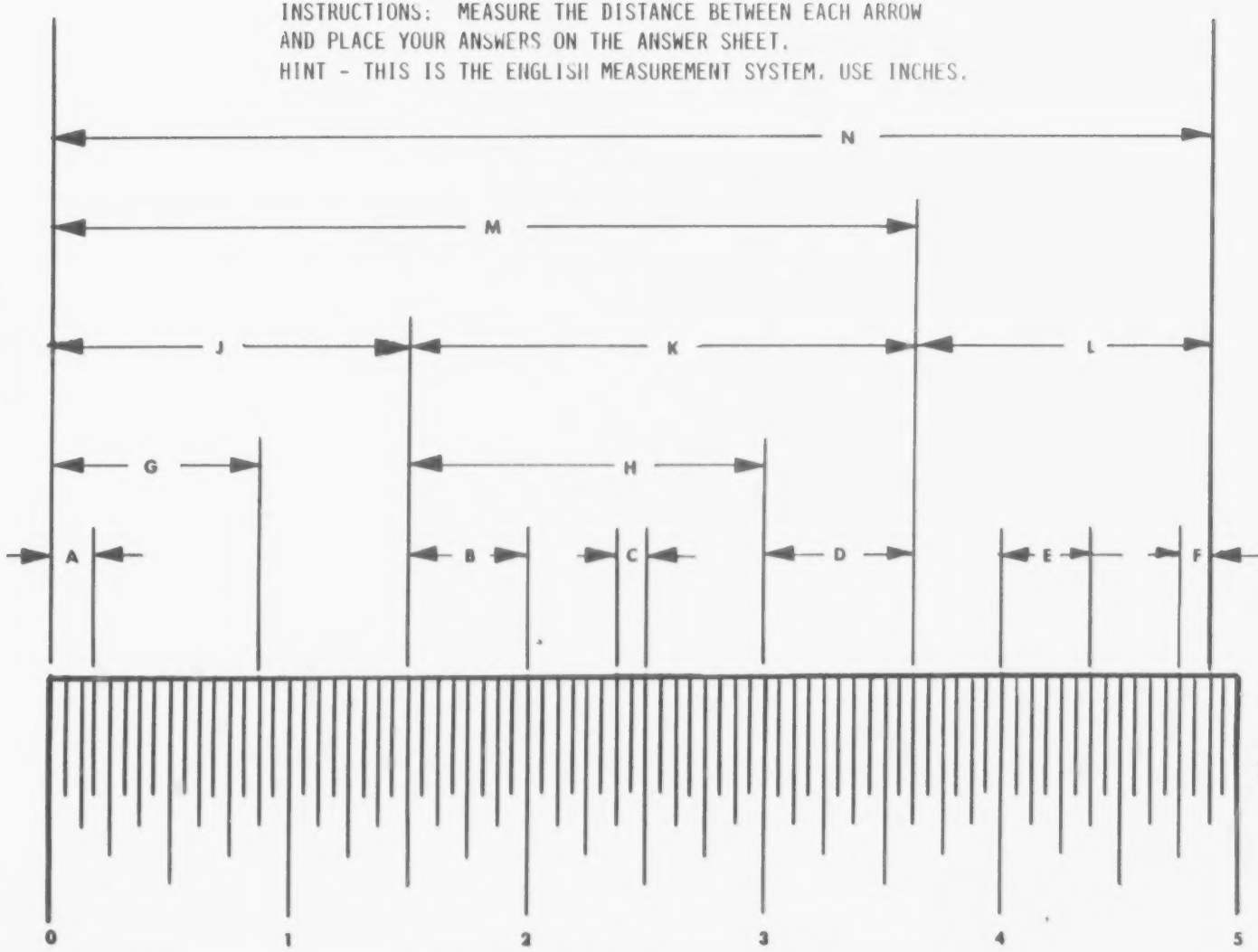
DAY 28



INSTRUCTIONS: MEASURE EACH LETTER TO THE NEAREST part OF AN INCH. PLACE YOUR ANSWERS ON YOUR CALENDAR. USE TODAY'S DATE, AND USE THE CORRECT SPACE FOR EACH ANSWER.

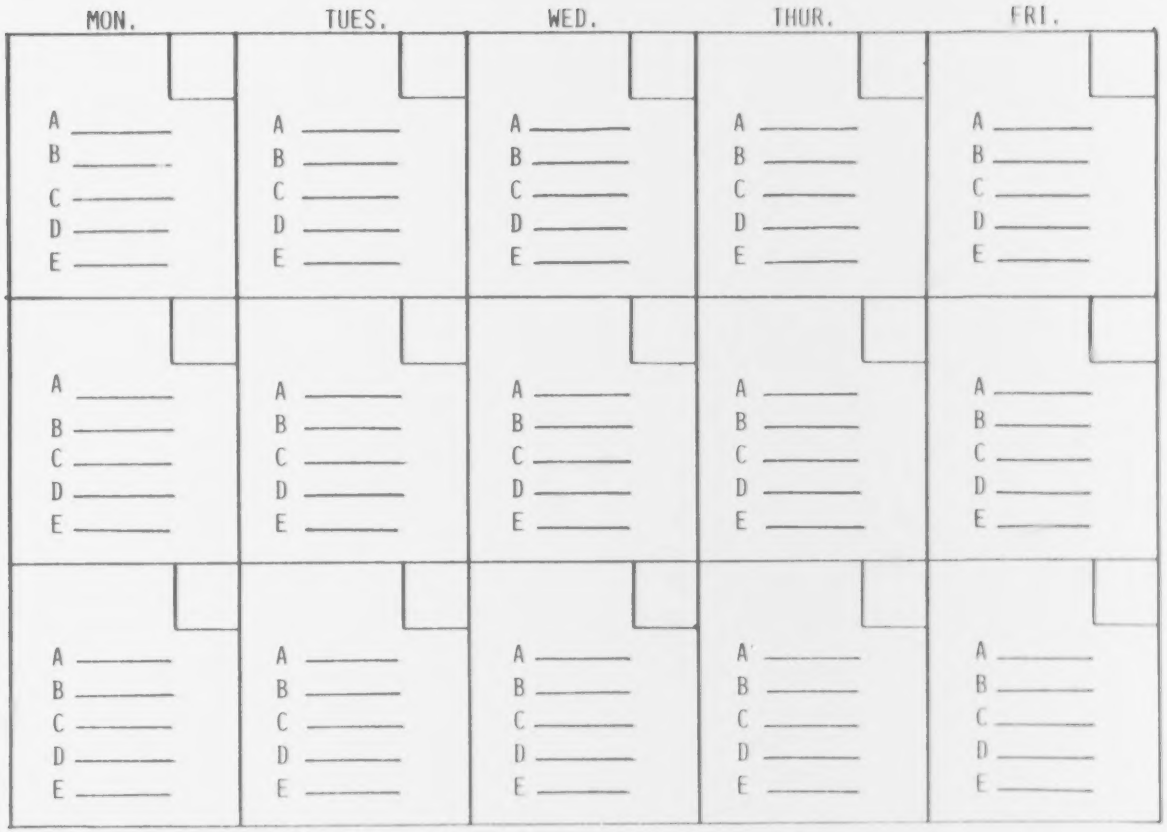
DAY 29

INSTRUCTIONS: MEASURE THE DISTANCE BETWEEN EACH ARROW
AND PLACE YOUR ANSWERS ON THE ANSWER SHEET.
HINT - THIS IS THE ENGLISH MEASUREMENT SYSTEM. USE INCHES.



POST-TEST
DAY 30

English Measurement System
80


MON.
TUES.
WED.
THUR.
FRI.
A
B
C
D
E

APPENDIX C

TABLE 1

Class	Type of Class	Time of Day	No. of Students
Per. 1	Gifted	8:00-9:00	15
Per. 2	Regular Ed.	9:00-10:00	12
Per. 3	Regular Ed.	10:00-11:00	17
Per. 4	Regular Ed.	11:00-12:00	16
Per. 5	Special Ed.	1:00-2:00	15
Per. 6	Uncontrolled Group (Regular Ed.)	2:00-3:00	20

TABLE 2

PERIOD 1 GIFTED EDUCATION STUDENTS

Student	Pre-Test %	Post-Test %	% Difference
1	53	84	+ 31
2	61	76	+ 15
3	46	92	+ 46
4	61	84	+ 23
5	76	76	0
6	84	92	+ 8
7	100	100	0
8	69	69	0
9	53	69	+ 16
10	84	92	+ 8
11	76	100	+ 24
12	69	84	+ 15
13	61	92	+ 31
14	92	100	+ 8
15	30	69	+ 39
Class Average	67.6	85.2	17.6

Class Success Rate = 11.25 students above 75%

Actual Rate = 12 students above 75%

TABLE 3

PERIOD 2 REGULAR EDUCATION STUDENTS

Student	Pre-Test %	Post-Test %	% Difference
1	30	76	+ 46
2	23	92	+ 69
3	100	100	0
4	15	23	+ 8
5	7	0	- 7
6	92	100	+ 8
7	69	76	+ 7
8	38	100	+ 62
9	0	53	+ 53
10	84	76	- 8
11	100	100	0
12	100	84	- 16
Class Average	54%	73.3%	19.3%

Class Success Rate = 9 students above 75%

Actual Rate = 8 students above 75%

TABLE 4

PERIOD 3 REGULAR EDUCATION STUDENTS

Student	Pre-Test %	Post-Test %	% Difference
1	15	100	+ 85
2	7	76	+ 69
3	38	100	+ 62
4	61	100	+ 39
5	7	61	+ 54
6	0	100	+100
7	0	84	+ 84
8	0	92	+ 92
9	0	69	+ 69
10	0	46	+ 46
11	0	76	+ 76
12	15	100	+ 85
13	7	84	+ 77
14	7	53	+ 44
15	0	76	+ 76
16	61	76	+ 15
17	0	84	+ 84
Class Average	12%	81%	69%

Class Success Rate = 12.75 students above 75%

Actual Rate = 13 students above 75%

TABLE 5

PERIOD 4 REGULAR EDUCATION STUDENTS

Student	Pre-Test %	Post-Test %	% Difference
1	7	76	+ 69
2	46	100	+ 54
3	7	53	+ 46
4	7	76	+ 69
5	15	84	+ 69
6	15	76	+ 61
7	0	53	+ 53
8	7	84	+ 77
9	7	92	+ 85
10	100	100	0
11	53	84	+ 31
12	0	69	+ 69
13	0	76	+ 76
14	7	46	+ 39
15	15	84	+ 69
16	7	76	+ 69
Class Average	18.31%	76.81%	58.5%

Class Success Rate = 12 students above 75%

Actual Rate = 12 students above 75%

TABLE 6

PERIOD 5 SPECIAL EDUCATION STUDENTS

Student	Pre-Test %	Post-Test %	% Difference
1	30	100	+ 70
2	7	38	+ 31
3	15	76	+ 61
4	61	100	+ 61
5	0	100	+100
6	61	61	0
7	0	61	+ 61
8	14	23	+ 9
9	7	61	+ 54
10	30	61	+ 31
11	30	92	+ 62
12	0	100	+100
13	0	0	0
14	0	84	+ 84
15	0	92	+ 92
Class Average	17%	69.93%	52.9%

Class Success Rate = 11.25 students above 75%

Actual Rate = 8 students above 75%

TABLE 7

Class	Student #	Pre-Test Av.	Post-Test Av.	Diff Av.
Period 1	15	67.6	85.2	+ 17.6
Period 2	12	54	73.3	+ 19.3
Period 3	17	12	81	+ 69
Period 4	16	18	76.5	+ 58.5
Period 5	15	17	69.9	+ 52.9
Total	75	33.9	77.2	+ 43.52

TABLE 8

	# Student Test	# Student Above 75%
Period 1	15	12
Period 2	12	8
Period 3	17	13
Period 4	16	12
Period 5	15	8
Total	75	53

Program Success Rate = 56.25 Student above 75%

Program Actual Rate = 53 Student above 75%

TABLE 9

PERIOD 6 REGULAR EDUCATION UNCONTROLLED GROUP

Student	Pre-Test %	Post-Test %	% Difference
1	7	30	+ 23
2	15	38	+ 23
3	7	23	+ 15
4	76	76	0
5	69	61	- 8
6	30	38	+ 8
7	23	46	+ 23
8	46	69	+ 23
9	30	38	+ 8
10	61	54	- 7
11	100	92	- 8
12	84	100	+ 16
13	53	30	- 23
14	46	46	0
15	38	38	0
16	0	0	0
17	7	38	+ 31
18	15	15	0
19	38	46	+ 8
20	46	53	+ 7
Class Average	39.5%	46.5%	7%

Class Success Rate = 15 students above 75%

Actual Rate = 3 students above 75%